ELECTRICAL REVIEW

[ILLUSTRATED]

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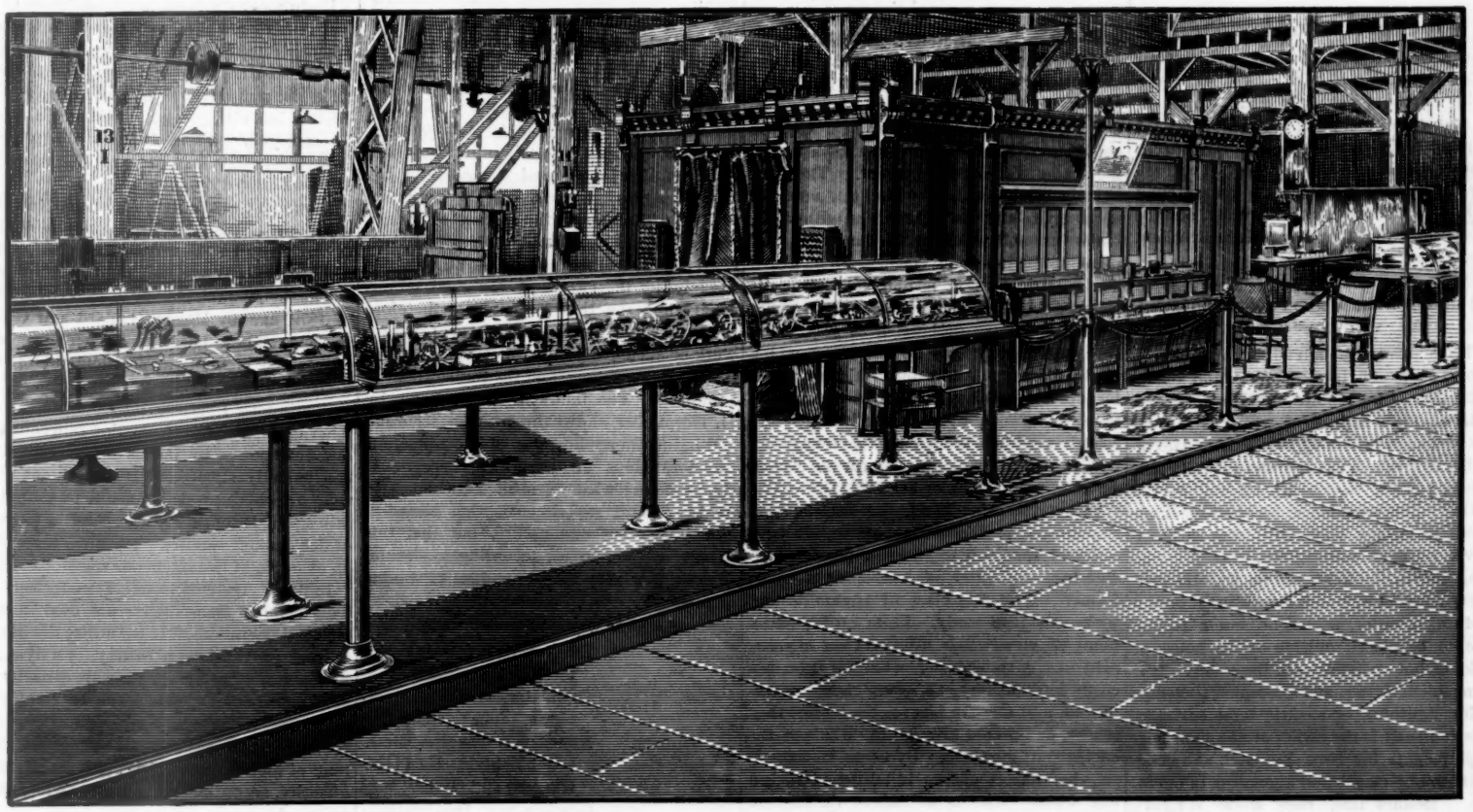
The American Bell Telephone and Western Electric Co's Exhibit at the International Electrical Exhibition.

The exhibit made by the American Bell Telephone Company at the International Electrical Exhibition, an illustration of which is given on this page, occupies a prominent place in the main hall of the exhibition, and is exceedingly complete and interesting. Carefully protected in glass cases are samples of pretty much every form of telephone and transmitter that has been used in actual service, besides a great many pieces of apparatus which were made for experimental purposes only. Among the most interesting are the instruments exhibited by Professor Bell at the Centennial, and the more familiar box telephones of the magneto type, which were used in some of the exchanges in the early days of telephone service. The earlier forms of the carbon transmitter are also shown, and those who are versed in the science of telephony can follow the progress of development on, step by step, until the complete and perfected apparatus, as now generally used by all the companies operating under Bell licenses, is reached. The Bell exhibit is made in conjunction with that of the Western Electric Company, and, indeed, the business alliance between the two companies is in many respects so close that any other arrangement would be impossible. In order to show an exchange in actual operation, the latter company manufactured especially for this exhibition a multiplex switchboard of the latest design and pattern, containing many improvements over any previously made, in arrangement, and an exchange has been set up by placing telephones in various parts of the building, which all visitors and exhibitors are at liberty to use freely. Not only is communication thus established between different parts of the building, but in addition, by means of a trunk line communicating with the Philadelphia exchange, conversation may be carried on with any part of the city or suburbs. This is a very great convenience to visitors and exhibitors, and is so freely availed of that the operators at the board are kept constantly busy. In this board, which is a very handsome piece of cabinet work, the cords and weights are below and to the rear, so as to be entirely out of sight. The thimbles corresponding to the drops in each section are in lower tanks by themselves, while the thimbles which represent the entire exchange, a full set being within the reach of each operator, are above. The drops are very small as compared with any previously made, and so, of necessity, are the "spring jacks," the result being great economy in room and also in the number of operators necessary, a much larger number of drops being assigned to each. The board, as set up, is for 400 subscribers, and is only eleven feet in length. We understand that it is a board of this type that is to be put into the Boston exchange, and that another, of similar construction but of a somewhat different arrangement, to meet the requirements of the toll system, has been ordered for the San Francisco exchange.

While the new switchboard is the leading and perhaps the most important feature of the Western Electric Company's exhibit, it is but one of many scores of articles which they show. Their cases and tables are loaded with many devices and appliances used in connection with telephony, and, although they are nearly all familiar to telephone men, they will amply repay careful inspection. Outside the field of telephony they show many things of interest. The joint exhibit of the Bell Telephone and Western Electric companies is surrounded by a row of arc lamps of the Western Electric pattern, which attract much attention. Their exhibit of hotel annunciators is complete, and so, too, is the watch, clock, and accompanying signal box exhibits. Of telegraph instruments, sounders, relays, etc., they show a goodly number, all of excellent workmanship, while the catalogue of what comes under the general head of supplies is long and formidable. We must not forget to mention the reel of several hundred feet of Patterson cable, through which the telephone connection is made with the wire which comes from the down-town exchange. No longer a novelty, it has become a staple article of production with the Western Electric Company, and is, we are informed, increasing in use very rapidly.



THE AMERICAN BELL TELEPHONE CO.'S EXHIBIT AT THE INTERNATIONAL ELECTRICAL EXHIBITION, PHILADELPHIA.

THE ELECTRICAL SUPPLY COMPANY.

The exhibit of the Electrical Supply Company of New York is very large and in every way creditable, every available inch of its space being used to show its specialties. It is fenced in with Clark's insulated cable, of which there are specimens of all sizes. This company, as agent for Callendar Insulating and Waterproofing Company, shows numerous samples of the Callendar cable, and also sections of the underground system of the Callendar Company in which their cables are packed in a square conduit of insulating material. The Electrical Supply Company is also agent for the sale of the Excelsior Telephone Wire, hard drawn, for which it shows, as the result of tests, excellent qualities in the matter of conductivity, tensile strength, and lightness of weight.

Another feature of this exhibit is the Diamond Carbon Battery, in which, by the use of a very large carbon surface, it is claimed that high electromotive force and low internal resistance are obtained. As is probably known to most of our readers, the battery consists of a number of cylindrical carbons surrounding a zinc rod. A very attractive exhibit is that of Wallace Carbons, running from $\frac{1}{16}$ of an inch to two in diameter. The larger sizes are adapted for electric arc lighting, while the smaller are intended chiefly for experimental purposes.

THE AMERICAN ELECTRICAL WORKS

of Providence, Rhode Island, has a very neatly arranged and attractive exhibit, which, though occupying small space, is exceeding full and complete, including pretty much everything in the way of electrical conductors from a telephone cord to a lead-encased cable. The demands for conductors for all the varied uses has called for skill, taste and judgment in their production, and their infinite variety of style and make is

admirably illustrated in the exhibit in question. Here are office and annunciator wire, lead-encased cables, telephone and electric light cordage, insulated electric light wire, both for line and for use in the manufacture of dynamos and motors, rubber-covered office cables, and a long line of other insulated conductors of every form and size for every sort of purpose. There is a big reel of the well-known Phillips' cable, in which the conductors are insulated with rubber, and then wrapped in tin foil, either separately or in groups, the whole having a woven covering and a coat of paint, and also a "Sabin" cable, rubber tape and painted.

A very interesting and valuable feature of this exhibit is that of very fine drawn copper and German silver wire in long lengths and of absolute size. We understand that this drawing is done by this company from larger wire, and that the absolute regularity of size is obtained by drawing through jewels. Here are the facts as to some of the samples shown :

One piece, weight	$1\frac{6}{16}$	lbs. dia.	.0045	in.
" " "	$1\frac{5}{16}$	" "	.004	"
" " "	$9\frac{11}{16}$	" "	.0225	"
" " "	$11\frac{9}{16}$	" "	.02	"
" " "	$1.\frac{3}{16}$	" "	.005	"

The great value of such lengths of wire of absolute size throughout, especially in the construction of delicate apparatus, will readily be appreciated, for absolute uniformity of size of course means the same uniformity of resistance.

KERITE INSULATION.

Mr. Clark B. Hotchkiss, general agent, makes an exhibit of Mr. Austin G. Day's Kerite wires and cables in great variety of size and styles, including armored cables for river and harbor use, of which this concern makes a specialty. Kerite cables have been very largely used in Chicago for underground work in connection with telegraphy, and the reports show that they have given excellent satisfaction.

THE RHODE ISLAND TELEPHONE AND ELECTRIC COMPANY.

This company, though still comparatively young, makes an interesting exhibit of its specialties. First comes the Rhode Island switchboard, a sample of which is shown. It is well known to telephone men, and needs no description. Next in order is the Breckenridge jack, a device for looping in the central office telephones, without breaking circuit or in any way interfering with the conversation of subscribers who may be using the line. Next comes the Howard Safety Appliance, which comprises at once a lightning arrester, a cut-out, and a fusible wire, to be placed outside of the house or building, but operated from the inside. It is an ingenious device, and a complete protector against lightning or electric light currents. This company is the owner of the time telegraph patents for New England, and make an exhibit of clocks and regulators in operation. Besides this, they show Wright's Patent Cable Clips, both the old and the new forms.

THE WASHBURN & MOEN MANUFACTURING COMPANY

shows samples of its well-known iron and steel wires, plain and galvanized, and also copper wires of various sizes, both hard and soft drawn. A new departure in the business of this company, though not specially interesting to electrical people as such, is the manufacture of watch and clock springs, samples of which are shown. The exhibit of the company may certainly be called a modest one, considering the immense business that is behind it.

THE NEW YORK INSULATED WIRE AND VULCANITE COMPANY

makes an extensive exhibit of insulated wires and cables in which the insulating material is what is known as "Okonite," for which very many advantages are claimed, especially superiority of insulation, and durability as to strength, toughness, resistance to the decomposing influence of the elements, and to the effects of changes of temperature. The exhibit consists of a great number of conductors of all sizes, and for nearly all purposes, from a single-covered wire to a lead-encased cable of any number of separate conductors. Okonite has rubber as a base, and makes a very even and handsome covering for wires.

MESSRS. PARTRICK & CARTER

make a modest but interesting exhibit of electrical supplies of all kinds, for telegraph, telephone, and electric light companies, and also patent needle annunciators and burglar alarms. Their cases are filled with instruments which show a high grade of workmanship in all lines.—*Continued.*

The Transformation of Electrical Energy.

M. Hospitalier, at a conference at the Conservatoire des Arts et Metiers last month, read a paper dealing with the elementary facts of this subject. The following is a brief extract of the paper, which, although containing nothing new, may serve as a reminder of the constant "changes" which really constitute the tools of the world.

The text of the lecturer was the text upon which modern science is founded, "The Conservation of Matter and the Conservation of Energy." Change is everywhere, but nothing is lost, nothing created. The study of this law embraces all physical and chemical science, but we do not occupy ourselves here with the phenomena attaching themselves to any form of energy except that known as "electrical energy." The characteristic quality of electricity is in its transmission to a distance by means of a metallic conductor, the action being known under the name of electric current. The phenomena is not local, as with heat, nor is it necessary to attain a right line as with light, but we are able to direct the current as we please to the most convenient point of usage. The electric current is obtained by various means—chemical, mechanical and otherwise—from apparatus designated as generators. On the contrary, any apparatus by which electrical energy is transformed into another form of energy—in virtue of the principle of reversibility—is a "receiver." Such are electric machines known as "motors," electric lamps, etc., which transform the electrical energy into work or heat.

If, on the other hand, the electricity reappears on leaving the apparatus, but with different qualities to those it possessed on entering, the latter is known as a transformer. It is this class of apparatus that we are about to study. From an industrial point of view, their utility is not *a priori* evident. A transformer, whatever it be, is a costly intermediary; all agents, however employed, cost more or less for the service they render, and do not give out the whole of the energy put into them. By using transformers, therefore, a charge is burdened with a loss which varies according to the circumstances and the actual return; that is, the relation of the energy utilized to the total energy expended is subject in their case to the above impost. But the nature of each application of electricity necessitates a certain kind of current, having special qualities, which must be obtained to get the best result. If the generator at hand does not produce the current required, the employment of electricity necessitates a transformer which shall give to the current the necessary properties, and this may in certain cases be very advantageous in spite of the losses entailed. The better to understand this, let us compare the current which flows in a conductor to water circulating in a pipe. In the two cases the characteristics of the flow are: (1), the force which produces the displacement; (2), the volume of delivery per unit of time; (3), the resistance to the flow. Water is displaced by virtue of pressure, difference of level, or height of fall; we express it in meters. Electrical motion is due to electromotive force or difference of potential, and we measure it in volts. The delivery of water, or volume flowing per second, is measured in liters per second, and of electricity in amperes. The unit of resistance offered to the propagation of the electric current is expressed by an ohm, whilst for water it is calculated by a fraction of the height of fall. Supposing we have three water-wheels working with a delivery of one liter falling from a height of one meter, we can arrange them in two different ways for the same expenditure of work: (1) by putting them one under the other, so that the water which has done work on the upper wheel shall fall on to the second and then the third. The characteristics of the fall will be one liter delivery with three meters of fall—a high fall and small volume. 2. We can arrange them side by side, so that each wheel shall receive one liter of water under a fall of one meter; the delivery will be three liters under a fall of one metre, large volume and small fall. With electricity the arrangements can be varied in the same way. If the current traverses all the machines successively, they are said to be arranged in tension, or in series, require high pressures, plenty of volts and few amperes. If, on the other hand, the current is divided between the various receivers or transformers, they are said to be arranged in quantity or derivation; in this case we require a large volume, plenty of amperes and little pressure—that is, few volts. If the generator at disposal does not produce the currents required by the arrangement of the machines, we must, in order to utilize it, have recourse to a transformer which will allow of variations according to our requirements.

Classification of Transformers.—If the transformed current has to be used at once, under penalty of losing the benefit of the operation, and, if its form only is modified, the transformer is said to be *instantaneous* If, on the contrary, a certain interval of time, more or less long, and theoretically unlimited, must elapse between the production and the utilization of the current, the transformer is called a *deferred* machine. In each of these cases the results can be obtained directly by the effects of electrical actions solely, and the transformation is therefore direct; at other times another form of energy, work or chemical action intervenes, according to circumstances, and the transformation is indirect. The following table, drawn by M. Hospitalier, shows the different scientific and industrial applications of the numerous transformations of electrical energy. It shows at once what we shall ascertain later on by several experiments, that electrical energy has but one nature, but that this energy appears to us, according to circumstances, with very varied qualities of volume or pressure :

INSTANTANEOUS TRANSFORMERS.

	Interrupted c. into alternate c.—The Ruhmkorff coil.
	Undulatory c. into undulatory c.—The telephone.
DIRECT. *Induction.*	Alternate c. into alternate c.—Jablochkoff, Fuller, Gaulard and Gibbs.
	Continuous c. into continuous or alternate c. by commutation.—(Cabanellas).
	Extra currents.
	Continuous c into continuous c.—Cabanellas. Manufacture of ozone.
INDIRECT. *Auxiliary use of mechanical energy.*	Continuous c. into alternate c.—Feeding Jablochkoff candles.
	Alternate c. into continuous c.

DEFERRED TRANSFORMERS.

	Leyden jar.
	Jars.
DIRECT. *Electrostatic actions.*	Condensers.
	Plante's rheostatic machine.
	Transformation by coupling up $\begin{cases} + \text{ amperes} - \text{ volts} \\ - \text{ amperes} + \text{ volts.} \end{cases}$
	Maintenance of continuous work.—Electric flywheel.
	Convenient separation of work and time of production and consumption.
INDIRECT. *Auxiliary use of chemical energy.*	Variable natural forces.
	Weak forces.
	Deferred utilization.
	Modifications of the qualities of current.
	Splitting up and distribution.

INSTANTANEOUS DIRECT TRANSFORMERS.

Interrupted Currents into Alternate Currents.—The best-known example is that of Ruhmkorff's coil, so frequently used in scientific investigations and experiments, such as for the illumination of Geissler tubes, Crooke's experiments, and so on. In this apparatus, generated at intervals, currents of low E.M.F. and large quantity are transformed into currents of very high E.M.F. and of small quantity. The product volts × amperes is the same, in virtue of the principle of the conservation of work. The qualities of the ultimate current depend upon the proportional lengths of the primary and secondary coils. Thus, causing the current from six accumulators with an E.M.F. of about 12 volts, to traverse a Ruhmkorff primary, we are able to render incandescent an Edison lamp requiring an E.M.F. of 100 volts by means of the secondary. The lecturer also explained how a double transformation could be obtained by using two Ruhmkorff coils. In either case, the increase in volts is at the expense of amperes, or the increase in amperes at the expense of volts.

Undulatory Currents into Undulatory Currents.—This method has received numerous practical applications in telephony. For feeble resistances—that is to say, with short lines, the transmitter is placed in the direct circuit; but with greater resistances a relay is employed. From 1877 to the present time this method has been applied to from 500,000 to 600,000 apparatus.

Alternate Currents into Alternate Currents.—The aim of this transformation is to modify the qualities of the current, and assist the distribution. It has been studied by Spottiswoode, by M. Jablochkoff, in 1877, by Fuller in 1879, and by Messrs. Gaulard and Gibbs in 1883. These latter gentlemen have employed the method in electric light operations.

Continuous Currents into Continuous or Alternate.—The transformation into continuous currents is by means of commutators conveniently arranged. If continuous currents are obtained, they must be transformed into alternate for such purposes as the feeding of Jablochkoff candles. The *extra current* is an example of instantaneous transformation.

Indirect Instantaneous Transformers.—This class of transformers are used in mechanical operations. If we utilize the initial current provided by a battery, or a dynamo with a motor, we obtain a certain quantity of mechanical energy, which can be employed in setting in motion a second machine, to produce continuous currents or alternate currents of high or low E.M.F., of large or small quantity, according to the use for which it is designed.

DEFERRED TRANSFORMATION.

Direct.—The apparatus used is generally of that class used in electro-statics, and has been known for many years. Examples may be given in the case of Leyden jars, the ordinary condenser, and so on. The Leyden jar, for example, receives and preserves during a certain time the electricity furnished by a statical machine, and gives it up as required in a series of discharges or otherwise, or may be used to drive a statical machine and produce work. The use of a number of such discharges enables us to vary the conditions of discharge. One of the principal applications of condensers is in submarine telegraphy, for duplexing; in fact the cables. The extensive application of this method is restricted.

Indirect Transformation.—Chemical action is the auxiliary used in this method of transformation. For example, a current is used to decompose certain chemical combinations. After a time, more or less lengthy, under certain conditions the elements separated will

recombine and furnish a quantity of energy sensibly equivalent to that which caused the decomposition. The secondary battery of M. Plante (1860), to which the name of accumulator has lately been given, is the type of this form of apparatus, and has been employed in industrial works by Messrs. Faure, Sellon, Volckmar and others. They are able to preserve their charge for several months without much loss by the employment of a series of accumulators and modifying the connections, and by the grouping in quantity or in series are able to obtain varying effects. Generally the grouping is not the same during a period of charge and discharge. Monsieur Plante has designed an apparatus to alter the system of grouping at these times, and M. Hospitalier has rendered it automatic by a commutator worked by the armature of an electro-magnet which effects the same operations. For electric lighting, for instance, the accumulators will be grouped automatically in quantity for charge and in series for discharge. These batteries of M. Plante permit us to make experiments in order to show the analogies which exist between statical and dynamical electricities. If with two Bunsen cells, giving a maximum of three volts, we charge 800 Plante couples, we can, connecting these in series, obtain an E M.F. of about 16 volts, each couple giving about two volts. If with these currents transformed we charge 50 condensers, made of plates of mica and foils, we may obtain a discharge of 32,000 volts and several millionths of an ampere, the effects of which will be comparable with those of a statical machine, or we can charge a Leyden jar, and repeat the experiments previously referred to. In order to give more interest to this part of the subject, M. Hospitalier made an experiment, by means of which a piece of carbon, of 9 mm. diameter, was made red-hot by means of the current from six Faure-Sellon-Volckmar accumulators. He expatiated upon the contrast between the results obtained before and after transformation. On the one hand, we get a current of low electromotive force, and after transformation very high electromotive force. Accumulations are often employed for the regulation of continuous currents. With a variable source, it suffices to put the accumulator in a branch circuit; in fact, the uses of accumulators are enormous. We may thus utilize natural forces, storing up the energy, and this application presents a grand field of research. The special properties of accumulators render them superior to direct transport, for which the initial force would not under certain conditions be sufficient, and under other conditions would be far too powerful. Storage facilitated, distribution diminishes the inconvenience of high potentials, and counteracts any accidental stoppage of the original source of energy; it permits the employment of the varying forces of nature, such as wind and tide, etc., which may be utilized by having wind mills or turbines, etc., likewise continuous force may be utilized to store up energy, which would be literally inadequate to carry on the work during the short time. Thus, Monsieur Menier lights his house with 150 incandescent lamps with a four horse-power gas-engine, used to charge accumulators during the day. M. Hospitalier then alluded to many other ways in which accumulators could be used with advantage. He concluded by a protest against the use of the terms "static" and "dynamic" electricity, which, he thought, would only confuse electrical students.

A Big Deal in the Carbon Business.

Negotiations have been going on for some time between the United States Electric Lighting Company, of New York, and the Boulton Carbon Company, of Cleveland, relative to the sale of the carbon plant and business carried on in connection with the United States electric light system. These negotiations were closed on the 25th of this month, by the Boulton Carbon Company purchasing the whole of the carbon plant, stock, and good-will of the United States Electric Lighting Company, which will be transferred to Cleveland.

This deal was brought about from the fact of the large increase of business and great demand for the United States lights, which has sprung up all over the United States. This necessitated an increase in their manufactory for dynamos and lamps, and not having sufficient room, they thought it to their interest to dispose of the carbon business, and put the whole of that room in the manufacture of dynamos and lamps.

In connection with this transfer, after making various tests of the different carbons manufactured in the United States, they found that the Boulton Carbon Company manufactured a carbon that suited their lamps better than any other make in this country, and on these terms the transfer was made, the Boulton Carbon Company agreeing to make carbons and supply the whole of the United States systems.

It appears, from investigation, that the Boulton Carbon Company's large increase in business has necessitated the building of a large factory, which is now in process of construction. This factory, when completed will be the largest carbon factory in the world. The dimensions of the buildings are as follows: One building two stories high, 350 feet long by 45 feet wide; another 250 feet long by 50 feet wide; and a third, one story high, 170 feet long by 45 feet wide. These buildings all run parallel, and the power is derived from a 250-horse power Buckeye engine. It is expected that the whole factory will be in full operation by the first of November. This gives them a capacity of 100,000 carbons per day.

The excellence of their carbons has been demonstrated by their having inquiries from all parts of the world, and they have shipped carbons within the past month to South America, England, France, Belgium, Holland, and Germany.

They have made many improvements in machinery, some of which are covered with patents, which enable them to produce at the lowest possible prices.

Besides carbon points, they manufacture every description of carbon plates for batteries, porous cups, diaphragms for telephone transmitters, telephone transmitter buttons, and for any other purpose for which carbon is required.

Electric Light in the Mechernich Mines.

The electric light installation at the Mechernich mines in its once volcanic Eifel district in Rhenish Prussia, has now had a fair trial for more than three years, and has proved a complete success. The expectation that it would both facilitate the operations and increase their security, has fully been realized, and an extention of the plant is now being carried out. Messrs. Siemens and Halske, of Berlin, undertook the work, which was superintended on their behalf by Mr. Boeddinghaus. An open working 2,000 ft. long, 1,000 ft. wide, and over 300 ft. deep, in which 300 men and 20 horses are continually occupied, was first to be supplied with the electric light. This part of the mine is excavated in steps, the horizontal terraces being provided with rails. Ordinary lamps in globes on poles were out of the question, as blasting operations continue throughout the day and the shots would soon have made havoc of the lamps. After several trials two powerful lamps, of 3,000 candles each, were erected at the upper margin of the pit where they were fairly out of the reach of the projected stones; and reflectors were fixed to throw the light down upon the steps. To find the proper position for these powerful lamps and to avoid too dark shadows caused some difficulty. But the illumination was finally rendered most efficient, and the open pit with the light playing on the whitish grey rock affords a fine spectacle. As any interruptions, even for short periods, such as those occupied in renewing the lamp carbons, would be dangerous, the whole plant is double; each lamp receiving its current from a D_2 dynamo. No hitch of any kind has occurred, and the safety of the miners has decidedly been augmented. It was formerly not always possible for the superintendents to see whether the loose mass resulting from the blasting operations had been properly removed, and frequent minor accidents arose from the debris falling down upon the miners engaged on the step next below. The work can now be controlled much better than before when petroleum lamps and hand lamps were in use. The cost shows a saving of about 4d. per hour in favor of the electric illumination. The satisfactory results obtained in the open working induced the company to introduce the electric light down in the subterranean galleries.

Electric Mine Lights.

SUCCESSFUL EXPERIMENT AT INDIAN RIDGE COLLIERY.

Beyond all comparison, the most interesting feature of the mining engineers' excurtion, on which many of the members of the Scientific Advancement Association accompanied them on Saturday, was the visit to Indian Ridge Colliery. It was rendered specially memorable by the fact that the mine was illuminated by electric lights, which will, no doubt, create a revolution in the system of underground illumination.

The appearance of things about the mine had been greatly improved by whitewash and other means in anticipation of the visit. The sides of the gangway were timbered to a height of several feet, and at short distances furnished with powerful reflectors that brought into full view the wagon tracks, the massive and glittering roof of anthracite, the turnouts, breasts, openings and other general features of anthracite coal mines. The roof of the gangways was of an average height of eight feet, but the entrance to the engine-room was much lower, and more than one of the visitors, incautiously shielding himself, brought his head in contact with the too hard roof. Both engine-house and the passage connecting it with the gangway had been whitewashed, and looked strangely off color to the engineer and his assistant. It was also flooded with light, and looked cosy and felt several degrees cooler than its fellow on the surface.

The breast, in which the electric light was called upon to play the principal part, is known as No. 1, and is on the east gangway of the north dip. It was selected on account of its nearness to the shaft, the distance between the points being 125 yards.

The first experiment was made the previous night, shortly before midnight. The electrician entered the mine on Thursday morning, and remained there for several hours. The first night an immense crowd of miners, with their wives and sweethearts, assembled at the head of the shaft. They were kept waiting some time, but finally were allowed to descend in squads. The experiment was a success. When the visitors arrived on Saturday, they went down in the same way; and at a given signal, suddenly and without warning, the six lights sprang to life, and showered their brilliant radiance upon the dazzled eyes and wondering faces of the startled crowd. Every foot of the huge opening became visible; the slightest projection stood out in bold relief from the surrounding surface; every crack, fissure and seam was plainly visible. What, in the light of a miner's lamp, looked like solid coal was now seen to be composed of alternate benches of coal and slate; even the difference between slate "boney" and coal could be distinguished under the rays of the electric light. The sight was magnificent. There was an air of grandeur; the solidity of the surroundings was the marked feature. The roof glittered in a glory hitherto only attributed to it in imagination, and it was a mingled sigh of wonder, contentment and relief that the crowd heaved when the lights were extinguished and the test was considered satisfactory.

M. Gaston Planté has been making some interesting and instructive researches into the probable cause of globe lightning, as it is called. With the aid of secondary batteries he obtained a current having an E.M.F. as high as 4,000 volts, and by this means he very successfully imitated globe lightning on a small scale.

Electric Properties of Flames.

In Wiedemann's *Annalen*, Herr J. Collert describes the results of investigations on this subject, of which the following abstract appears in the Chemical Society's *Journal* for June: "This investigation is a continuation of Hankel's researches on the electrical properties of the Bunsen and alcohol flames. The method of experiment was as follows: A spiral of platinum was placed in the flame symmetrically with its axis, and connected with one pole of a Hankel electrometer, the other pole being in connection with the burner; the electrometer was also connected by a commutator with the poles of a zinc-copper pile conducting to earth. The principal results of the investigation are as follows:

"1. The difference of potential is dependent on the material and the temperature of the mouth of the burner; an electro-potential series of the materials of which the burners are constructed can be arranged, of which iron is the most negative. 2. The difference of potential is also conditioned by the position of the spiral; the point at which the greatest electromotive force is produced coincides probably with that of maximum temperature. This latter result probably represents the sum of several conflicting causes: first, by the rise of temperature the platinum is positively electrified; secondly, by contact with the hydrogen and carbonic oxyde gas it is negatively electrified; and thirdly, in the cooler parts of the flame it is positively electrified by contact with steam and carbonic anhydride. As regards the second of these points, the experiments of Deville tend to show that the higher the temperature the greater proportion of free hydrogen and carbonic oxyde present; while Grove has shown that platinum is negatively electrified when in contact with these gases. 3. The results obtained by the author agree with those of Elster and Geitl; the former finds for the E. M. F. of a platinum spiral in a Bunsen flame = 1.95 Daniells, in an alcohol flame=1.43 Daniells; while the latter obtained the values 1.92 and 1.44 Daniells respectively.

The Baltimore & Ohio Railroad has made a contribution in aid of its employes in the shape of the payment of the yearly interest on half a million dollars at five per cent. This is $25,000 a year, and is to be specially devoted to establishing a system of pensions to be paid employes incapacitated by any cause from earning a living. Those who have been in the service ten or more years, or who at sixty-five retire from active duty, secure the advantage of the new order of things, as also those whom the company may retire at sixty, or who in the contraction of infirmities become unable to perform the service assigned to them, or of securing a livelihood in other pursuits. Incapacity by reason of accident or sickness is already provided for in the old established features of the association, which in four years has already paid employes and their families $686,000. The advantages accruing under the operations of the life insurance provisions of the organization are not affected by the pension payments, being protected in plain terms and thus continuing the employe's family in the certainty of monetary help in case of death. The pensions are to be scaled according to the grade in employment and the longevity allowance, being one per cent. for each year's service, and is added to the pension of those who serve upwards of ten years.

Rowland G. Hazard, Robert W. Blackwell, Josiah L. Blackwell, Philip Chater, Hugh Stevenson, Everard De Renne, Francis B. De Calvo, and Warren B. Adriance are the incorporators of the Bentley-Knight Electric Railway company, whose certificate of incorporation was filed in the County Clerk's office here last Monday. The company is to build, sell, and let locomotives and other rolling stock for railways in the United States and Canada. Its capital stock is $1,000,000, divided into shares of $100. Messrs. Bentley and Knight are two young men who gained their reputation in working out a system for underground wires. Lately they have been experimenting with electric railroads at Cleveland, Ohio, the result of which has been the forming of the new company.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, SEPTEMBER 20, 1884.

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The approaching decision in the long-delayed telephone suit of the Bell Company against the Drawbaugh people, was very generally and fully discussed in Philadelphia this week, and a great many learned decisions were rendered. Unfortunately they didn't all agree, but they were all learned, nevertheless.

As we have before said, we believe in competition in the telegraph business, and hope to see a strong competing company maintain itself. It is better for the community, better for the Western Union, and better for the telegraph business, for, as we have before said, we believe that there is an enormous increase in the use of the telegraph coming, and that nothing will so much tend to bring it as low rates and competition. It is in some respects with telegraphing as it is with railroading, no one knows how cheap it can be done provided there is plenty of it to do, and we are firm in the faith that there will be an abundance of it to do, provided rates are made low enough to make it inviting. A man who has once got into the habit of doing business by wire, and of getting quick responses, is not going back to the mail, any more than a man who has learned to appreciate the rapidity of railroad travel is going back to the stage-coach; and it is because low-rates invite men in to use the wires and to become accustomed to them, that we look to them to insure a permanent increase in business. This country's business is going to be done by wire almost exclusively. Where there is one wire now there are going to be ten twenty years hence, and the volume of business is going to be such that, owing in part to improved and more economical methods, the companies are going to be in a position to do business which would seem absurd if named to-day. The rate to Philadelphia, for instance, from New York, is fifteen cents, which includes both collection and delivery. This would seem to be low enough, but, when it comes to long messages, the cost for collection and delivery will be no greater, nor will the cost of transmission, save in the operator's time. It is then in long messages that we may expect to see reduced prices, and it is reduced prices that are going to invite people to send long messages. The tendency is already to increase the length of the average message, and we expect to see a still greater increase in the near future.

THE TELEGRAPH COMBINATION.

It seems that the three telegraph companies which entered into a close alliance have, after a very brief union, agreed to disagree, and that the hearts of the three no longer beat as one, but as three. The cause of this disruption seems to have been the unexpected and unlooked-for dimensions of the liabilities of one of the companies—liabilities so great that the other parties to the contract did not care to join in carrying them. Thus a combination, which threatened to be a formidable rival to the Western Union, is broken up, and the three companies will do their own work, each in its own way. The general opinion seems to be that the Bankers and Merchants', which is the embarrassed company, will be "taken in" by either the Baltimore and Ohio or the Western Union, with probabilities in favor of the latter. But before any such absorption can take place the price has got to be made right, and it is quite certain that neither would be willing to take it and assume the company's bonded indebtedness at par. Unlike the situation at the time of previous absorptions, the company whose business is now in the market is not, owing to its crippled condition, a dangerous competitor, and therefore, while there may be some competition to secure it, it is not of sufficient importance to warrant either the Western Union or the Baltimore and Ohio in bidding up the price. Probably, were the Western Union to take it, the result would be merely to duplicate its lines to leading points, whereas, were the Baltimore and Ohio to take it, more territory not now reached would be added to its domain. The Bankers and Merchants' has been built very largely by making payments for supplies and contract work in bonds, and, to effect such negotiations, bonds have had to be put at a price which would make them tempting. Thus it happens that the bonded indebtedness is large in proportion to the value of the plant, and that it could be duplicated for actual cash at a figure far below that at which it now stands to cost the company.

Whatever may happen to the others, we look to see the Baltimore and Ohio Company keep right along, doing its share of the business and taking its share of the profits. It is a strong company; it has a powerful backing; its lines have been built upon business principles and on a cash basis, and it has come with a view to staying permanently. The combination failing, it will, no doubt, step to the front as *the* opposition company, and it would not be surprising if a new combination were entered into with the Postal, in view of that company's control of cable lines. Should the Bankers and Merchants' fall to the Western Union, it will devolve upon the Baltimore and Ohio to build and equip such lines as may be necessary to reach points from which it is shut out by reason of the failure of the combination. This it has the means and the courage to do, and it may reasonably be expected that it will undertake the work without hesitation.

TELEPHONE INTERESTS.

Telephone interests are decidedly at the front just now. The meeting of the telephone convention in Philadelphia this week, bringing together representatives of the telephone interest from all over the country, has naturally brought a great deal of telephone talk to the surface, and the hearing in the Bell-Drawbaugh case, now very near at hand, naturally makes the subject uppermost in many minds. During the past year the process of consolidation, begun in the previous year, has been carried out extensively. The number of companies has by this means been reduced, and the management of telephone affairs has, as a consequence, been concentrated in fewer hands. Another thing to be noted is that the hard times have depreciated the market value of telephone securities; that companies, although rich in treasury stocks, have found it difficult to sell their holdings for the purpose of increasing plant, and that, as a consequence, they have been forced to practice the most rigid economy in order to make both ends meet. The fact has also been developed that, in their anxiety to obtain subscribers, many companies have put their rates so low that they are doing at least a portion of their business at a loss, and they are gradually coming to realize that if they want to do even a fairly remunerative business they must have the courage to go to their subscribers and say frankly that in fixing their rates they made a mistake, and that, on sound business principles, the only thing for them to do is to rectify it. Again, telephone interests, and especially telephone service, are suffering to-day from hasty and imperfect construction of plant from the start. Lines which were put up five or six years ago, and worked "well enough" then, are, many of them, in very poor condition to-day, and, to remedy the difficulty, they have got to be renewed or repaired—a process which costs money, and money, just now, is not abundant.

In brief, it may be said that the telephone business has passed through its "booming" stage, and that the pendulum is now at the other end of its swing. The process of recuperation has already begun, and is beginning to show its effects. Companies which have been prudently and conservatively managed are getting along without serious trouble, and those which have not are mending their ways and trying to get back to a hard-pan basis. The process is trying, even painful, but it is far better than to be forever out of depth, floundering about with the prospect and even probability of drowning constantly before one's eyes.

As we have said, the near approach of the Bell-Drawbaugh suit has been a disturbing element. Whatever men's faith may be in the success of the Bell, there is still an element of uncertainty. Then as to the effect of a decision, one way or the other, men's minds are much divided. That a favorable decision would put up the price of Bell stock, and that it would, in the end, tend to the advantage of the subordinate companies, there can be no question, but that it would immediately advance the price of the stocks of the subordinate companies is by no means so certain, especially as, were the tendency that way, there are so many anxious to sell as soon as a rise is indicated. The fact is, that the time has come now when the shares of telephone companies are going to be valued at their dividend earning power, and this can only be proved by actual results.

That the telephone is increasing in popularity, there is, and can be, no question. That the ratio of increase is less this year than last proved nothing, except that last year was an exceptional and phenomenal one, and that much of it was not of the healthy, substantial sort. It is against the figures which such a year produced that the present is working, and it is not surprising if, judged by the figures alone, the result seems unfavorable. But it must be remembered that such heavy advances as last year should necessarily engender heavy fall-backs later on, and that, in the present case, the fall-backs come upon this year's record.

The Telephone Convention.

The sixth annual meeting of the National Telephone Exchange Association was held in Philadelphia during the past week. The opening session was appointed for Tuesday at ten o'clock, but it was fully eleven before the meeting was called to order by Col. W. H. Eckert, General Manager of the Metropolitan Telephone and Telegraph Company, Vice-President, in the absence of the President.

The first business in order was the calling of the roll, which showed that a fair proportion of all the corporations belonging to the association were represented, and that a like proportion of the honorary members were present. Then followed the report of the secretary, from which it appeared that a large number of corporations had ceased to be members, owing to the fact that they had, through consolidations, ceased to have separate existence. The report of the treasurer, which was also read by the treasurer, showed that, with the surplus carried over from last year, the receipt for the year had been $1,468.91, and that, after meeting all payments for the year, there remained in the treasury $708.54.

Mr. A. Bretone, General Manager of the telephone company of Paris, France, and Mr. John Cassidy, Superintendent of the telephone company in Hawaii, Sandwich Islands, were chosen honorary members. Both were present, and expressed their thanks.

The next business was the election of officers for the ensuing year, which resulted as follows: President, Morris F. Tyler; Vice-President, Wm. H. Eckert; Secretary, W. D. Sargent; Treasurer, H. L. Storke. Member of Advisory Committee, to serve three years—W. A. Jackson. Executive Committee—Morris F. Tyler, *ex-officio;* James Bigler, Henry Metzger, and W. L. Easterbrook.

The amendments to the constitution proposed at the last meeting, looking to the substitution of individual for corporation membership, were brought up and discussed, but were finally laid on the table by a nearly unanimous vote.

At this point Mr. Morris F. Tyler, president of the association, entered the hall, having been prevented from being present earlier by a delay of trains. He was warmly received, and, being called upon for a speech, spoke briefly, but very forcibly. He said that three things were just now giving telephone men cause for serious thought. The first was the hard times; the second, the patent suits against the parent company; and the third, the relations of licensees to the parent company. He believed that the hard times would soon pass away; and he felt satisfied, after a very careful investigation, that the parent company would certainly win the suits now pending; as to the third point, he could only say that if, as he believed certain, the patents were sustained, the parent company would be master of the field, and would naturally expect to reap the benefit: therefore, he claimed, it was for the companies doing an exchange business to give the best service possible, and make the public pay properly for it. This would enable them to pay their dues to the parent company, and still have left a proper profit to be divided among their own stockholders.

An amendment to the constitution, providing that at each annual meeting the time and place of holding the next annual meeting should be fixed by the association, was then adopted.

It was announced that free tickets for the electrical exhibition had been provided for the use of members of the convention, and, on motion of Mr. Fay, the thanks of the association were voted to the managers of the exhibition for their courtesy.

A vote was passed that a special committee be appointed by the Chair to report upon a new list of standing committees.

Adjourned until 2:30.

AFTERNOON SESSION.

At 2:30 the association came to order, President Tyler in the chair.

In accordance with the report of the committee appointed in the morning, it was voted that the next annual meeting be held in

Providence on the second Tuesday in September, 1885.

It was also voted that the sessions of the present meeting be from 10 A. M. to 1 P. M., and from 2:30 P. M. to 5 P. M.

Mr. Eckert then read at length the report of the Committee on Legislation, from which it appeared that legislation adverse to telephone interests had been undertaken in a number of States and municipalities, and that in quite a number of cases it had been carried through and now had the force of law, while in others it had failed of enactment. The general opinion seemed to be, as developed in the discussion which followed the report, that while this legislation had in all cases proved annoying, and in some burdensome, owing to taxes imposed, it had in no case seriously interfered with the work of exchanges, although the fear was expressed that such would prove to be the case in the near future.

Mr. Sargent then read the report of the Committee on Exchanges, which was chiefly made up of statistics, many of which were incomplete, but will be made up in time for publication in the official record of the meeting. Considerable discussion followed the reading of this report, after which the meeting adjourned for the day.

On Wednesday morning the convention reassembled soon after 10 o'clock, and, after the transaction of some routine business, listened to the report of the committee on aerial cables and underground systems, which was presented by Mr. Lockwood. It was based very largely on a series of questions addressed by the committee to the various companies, and the answers received, and was interesting as giving the results of varied experience. Still there was a noticeable lack of willingness on the part of the respondents to express themselves decidedly as to the relative merits of the several makes of cables. The discussion which followed, including a paper by Mr. Fay on some underground tests in Chicago, and statements by M. Bretone, of Paris, concerning underground work there, was exceedingly interesting.

The afternoon session, which was the closing one, was largely devoted to the description of some interesting experiments undertaken by M. Bretone in Paris. Mr. Lockwood described the experiments by the means of diagrams, and M. Berton answered numerous questions. The whole will be given in full, with illustrations, in the Association's printed proceedings.

Notes of the Exhibition.

Perhaps nothing attracts more attention just now than the exhibit of the Peoples' Telephone Company, representing the Drawbaugh claims. When the exhibition opened it consisted of a long and narrow structure, which some said resembled a coffin on a table, along the sides of which various models were shown. In time this was covered with a white cloth, which the wicked called a pall. Now this catafalque-like structure has been ornamented with a placard in very black letters, surrounded by an equally black border, the inscription being as follows:

"The telephone suit is to be argued in the United States Circuit Court of the Southern District of New York on the 22d of September.

"As soon as the arguments in this case are concluded this exhibit (containing representations of the original instruments now in the custody of the Court), will be displayed.

"The Peoples' Telephone Company."

Doubtless there was some good reason for this, but, as the arguments will no doubt consume at least three weeks, it seems as though this lugubrious display might have been avoided.

A very small proportion of electrical apparatus serves, it seems, to secure admission to exhibits. For instance, here is a great, noisy brick making machine, in full swing, a very ingenious mechanical device. The only thing electrical about it that I have seen is the registering device for showing in a distant office the number of bricks made. Then there is the patent hatching apparatus. Electricity is used, but only in connection with the regulation of the temperature by opening and closing dampers. Then there are clocks, whose claims, as set forth on a conspicuous signboard, are that they run a year without winding and "without electricity." Evidently the managers did not draw the line very closely.

Somebody hit upon the capital plan of posting "Electrical Primers" through the building. They tell, in a few words, and in simple language, enough to give visitors an intelligent idea of what they are seeing. For instance, one tells what an arc light is, another what an incandescent light is, a third what a battery is, and so on. I notice that in almost every case corrections have had to be made in pencil, which shows that proof reading is sometimes as badly done in Philadelphia as in some other cities I could name. Napoleon once shot a publisher, and thereby won the gratitude of all authors. If he had only done the same by a proof reader, just for example's sake, every editor would sound his praise forevermore.

There is a big pile of copper wire, something over a ton and a-half, artistically piled up in coils near the Bell Telephone exhibit. It comes from the Bridgeport Brass Company, and a portion of it is identical with that used in the construction of the copper circuit between Boston and New York. It is evenly and handsomely made, and very bright under the glare of the electric lights, but otherwise it looks a good deal like ordinary copper wire, and altogether too innocent to be so much talked about. And yet it *is* a good deal talked about, and there are those —nor are they few—who believe that the "age of iron" and the "age of steel," as applied to electric wires, is to give way to the "age of copper." Certainly all experience so far shows that a small copper wire is far better than a large iron one, and word comes from England that the putting up of iron wires has practically stopped. When copper wire was up at the high prices which ruled four or five years ago, the difference in cost made the use of copper almost prohibitive; but now that ingot is bought by large manufacturers at thirteen cents, with a possibility of lower figures still, the substitution of copper for iron in much new work seems not only advisable, but probable.

By the way, it is not only necessary that wire for this use be drawn hard, but that it *remain* hard. There is a good deal in this. One manufacturer told me this week that some time ago he made some hard drawn wire by a peculiar method, and that it answered all the tests as to conductivity and strength. Animated with the suspicion born of long experience and many unlooked-for accidents, he hung it up for six months, determined not to crow too soon. Then he took it down. As to conductivity it was all right, but its "hard" properties had vanished. It was as soft as punk. So he went back to the older method, that which had given such perfect satisfaction in the past, and said nothing about his "new process."

As the Western Electric Company is agent for Boulton Carbon Company, the latter's exhibit is included in the former's. It is a handsome show, and includes every form in which carbon is used for electrical purposes. This carbon industry is practically a new one, having grown out of the needs of electrical companies of all sorts, and the improvements have been very rapid and marked. I remember when, if a piece of carbon was wanted, it had to be sawed out of a lump of gas-retort carbon. Now they use gas-retort carbon very little, substituting petroleum coke, which they grind to an impalpable powder, mould under pressure to any form desired, and then bake or "fire" until the requisite hardness is obtained. It is by no means a simple matter, and a very large and expensive plant is necessary to carry the business on successfully. The Boulton people have recently greatly increased their facilities, and are doing a very large and successful business. The day of high prices and big profits in carbons has passed, but the demand is so great that even at a small margin the returns are satisfactory. I saw one carbon about four feet long and over an inch in diameter, and innocently asked what it was for, supposing that it had been made for some special long-burning lamp, but I was told it was made "for fun." So it seems they combine pleasure with business out in Cleveland.

Telephone men get wedded to their switchboards, just as ladies get wedded to their sewing machines. I could name ladies who are the personification of peace and mildness; but say one word in their presence against the make of sewing machine which they have adopted as their own, and signs of disturbance may be observed at once. I ventured this week to ask a telephone man from the Far West his opinion of a certain style of switch-board. I was seeking information. I certainly meant no harm. But, unfortunately, he construed my innocent question into an attack. Then I had to take it, hot and heavy. He poured out the vials of his wrath and indignation upon all the switchboards except that which he has adopted as his "ownest own"—I got that phrase from a story paper I was reading while they were telling each other about induction at the convention on Wednesday—and gave me to understand that no one but a driveling idiot would use any other. I pacified him by explaining that I had never owned a switchboard and had no use for one, but that, should I ever come to need one, I would bear his timely warning in mind.

The little electric railway is apparently nearly ready to run. The track is so short and the car so small, that the whole thing hardly rises above the dignity of a toy. The peculiar feature is the method of conducting the electricity to the motor. It is done by means of two brass tubes, one on either side, with a slot cut along the under surface, into which the connecting device, not yet shown, projects. Doubtless this insures good contact, but in a road of any length it would involve very great expense.

The attendance has materially increased, especially since the marked change in the weather, and the crowd which comes every evening fills the building comfortably full. Great interest is manifested in everything, and those having exhibits in charge find their time fully occupied in answering questions. In this way the exhibition is doing excellent service as a public educator.

Speaking of induction—a very interesting and fruitful theme—I am reminded of something Edison told me last evening. It seems that one of the six or eight inventors who show their "underground system" at the Exhibition took him aside yesterday and said quietly, "Mr. Edison, I want you to do me a favor. Tell me what induction is." "My dear friend," answered Edison, with a twinkle in his eye, "I'm pretty busy just now, but if you'll hire a room somewhere, so that we can pass a quiet week together, perhaps I shall be able to tell you what I know about it."

As I said, there are six or seven "underground systems" on exhibition. I cannot learn that any of them have had any real tests, or that any of them present anything really novel. I was pleased at the assurance of the gentleman who presides over one of them. He assured me that it was absolutely sure to work; that all this talk about induction and retardation was "stuff and nonsense;" and that he was assured privately by all the scientific men, whose opinion was worth having, that his system could be relied upon to produce the very best results. He also hinted that the "big companies, although claiming that the desired system had not yet been found, were quietly negotiating with him for the possession of his patents." I congratulated him upon his manifest good fortune, and came away. He asked me "not to mention it," and so I refrain.

The Electrical Conference.

Professor Rowland, of Johns Hopkins University, in his address at the opening of the Conference of Electricians on Monday, spoke with much earnestness upon the duty of this rich country to give better and far more encouragement to original scientific research than it does. No other country can cast reproach upon us as being in the rear so far as practical application of science is concerned; our multitudinous inventions show this; but in the cultivation of science *per se* we are regarded as but children in the eyes of the world. We ought to be something higher than practical. We should repay the rest of the world in kind for the pure science we get from it. We should have numerous great laboratories, where our men of genius should be placed, in which they should be liberally maintained, and have no other duty than to devote their genius to original investigation.

The foregoing is not a verbatim report of what Professor Rowland said, but is a condensed and rather free rendering of the thoughts he expressed in that part of his address. It has been proclaimed, and has been made a suggestion to the munificent benefactors of institutions for the promotion of learning, as vastly better policy than the expenditure of their rich gifts in the erection of monumental buildings in which to house new colleges to begin a precarious hand-to-mouth, poverty-stricken existence. America has her men of genius, richly endowed with the capacity for pure scientific research; but, so far as they come to the public knowledge, they are mostly poor professional men, who are obliged to devote nearly the whole of their time to such immediately practical work as will make a living for themselves and their families. In the main, their energies have to be exhausted in the drudgery of teaching, or in such casual, experimental or field work and study as will enable them to prepare their lectures. The two duties—elaborate original research and the daily drudgery to earn the daily livelihood—are incompatible. For this reason, endowed chairs for men of genius for scientific research are indispensable. One of these can do more for the advancement of the world's knowledge than half-a-dozen of some so-called college piles upon which rich benefactors have wasted millions of dollars—imposing architectural structures with half-famished faculties within. We could name a single establishment for which there was scarcely any need, but upon which more money was lavished than would have amply endowed ten chairs for such scientific research as that to which we refer—the research which opens the way to nearly all of the best we have in the way of science and discovery practically applied to the every-day affairs of the world.

We have men in abundance equal to the work, some of whom have done wonders, considering the way their time is consumed by the drudgery of their daily duties.

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* * School competitions are seldom organized on such a sensible basis as that proposed by Colonel Banes, in his offer of prizes to the pupils of public schools, who write the best essays on what they have seen at the Electrical Exhibition. The competitors are expected to go to the exhibition, select for themselves one or two objects which they consider of interest, and make these the subject of descriptive essays. The points to be considered in deciding upon the merits of the essays are just the opposite of those usually selected for "marking" compositions. If the pupil has made a good selection of subject, and has clearly and accurately described what he has seen, these are strong points in his favor. Rhetorical qualities, outside of those essential to clear description, are not to be considered, and unimportant grammatical errors are to be disregarded. Colonel Banes has thus inaugurated a very good scheme of object teaching and of examination for merit. The pupils will be sure to derive benefit from the study of the exhibition, to which they have been invited, and their attention is directed by the terms of the competition to the real tests of fitness which the world will apply to their essays or letter writings after they have left school.

Telephonic News

*** The meeting of the National Telephone Association was unusually well attended, and the proceedings were quite as interesting as any heretofore held. The exhibits of telephonic apparatus at the Exhibition Building were more complete than usual.

*** The Sunset Telephone Company, of California, are using an A. G. Day Kerite Cable, 10,000 feet long, across the Golden Gate from Fort Point to Lime Point, in connection with a telephone line 65 miles long. General Manager Sabine states that the service is excellent.

*** Some interesting experiments were made with the telephone recently between Rome and Florence, in Italy, Signor Genala, the Minister of Public Works, several times communicating with Signor Gadda, the Prefect of Florence. The two telephones, which were connected by ordinary telegraph wires, worked successfully enough, although the buzzing precluded a perfectly distinct transmission of the voice. On the other hand, a cornet played at the Florence end was very well heard at Rome.

*** In regard to the underground wire business we should say that the first thing for the city of Philadelphia to do is to obey its own laws. The city wires help to make the great network which disfigure the streets from an æsthetic point of view. They should be taken down and put under ground at once. It will only cost a few hundred thousand dollars, and by that time they will know more of what they are howling about. Unless this is done the case against the telephone and telegraph companies will be greatly weakened.

*** It is stated that Messrs. Wendell & Phillips (John G. Phillips and Joseph E. Stringer) of Boston have purchased the exclusive rights for the export and introduction into Honduras, Nicaragua, Costa Rica, San Salvador, and Guatemala of telephone and all telephonic goods patented by the American Bell Telephone Company, and will at once commence vigorously to push work in this territory through their representative, Mr. E. Cardoso, who leaves for there this present month. As these gentlemen have already commercial relations with Central America of considerable importance, and as the rights for this extensive field have never before been granted, good results may reasonably be expected.

*** M. Van Rysselberghe and the telegraphic engineers of the Belgian Government are now engaged in completing the arrangements and modifications necessary for the simultaneous transmission of telegraphic messages and telephonic conversations. The Bell Telephone Company is also carrying out some important works in its central offices, as well as laying down junction lines, so as to permit of its subscribers using their instruments for distant speaking. At Brussels alone the length of the lines laid down for this purpose is nearly 70 kilometers = 45 miles. This brings up the length of wires in Brussels and its neighborhood to over 1,100 kilometers = 730 miles, serving more than 600 stations. The total length of this company's wires in Brussels, Antwerp, Ghent, Verviers, and Charleroi is about 1,500 kilometers = 1,000 miles, serving more than 2,500 stations. Independently of the conceded lines, there are a number of private lines in Belgium established on the property of their owners. By the connecting of certain stations already in communication with the central offices, telephone lines of 15 and 20 kilometers, or 10 and 15 miles, have been worked. In the Antwerp concession, with which is connected the military system of that city, there is a combination of lines having a length of 33 kilometers, or 22 miles. This combination is complicated by the intercalation in the circuit of five calling signals, which, by their additional resistance, still further increase the total resistance. Notwithstanding this fact, the calls by the magneto-electric bells, imported into Belgium by the International Bell and Telephone Company, of New York, as also the telephonic communications by means of Blake microphones and Bell receiving instruments, are made without difficulty. Moreover, experiments have been made in Belgium, even on the longest line in the kingdom, with Blake and Bell instruments; and between Ostend and Arlon, a distance, as the crow flies, of 270 kilometers, or 180 miles, telephonic messages have been exchanged by these means.

The Telegraph in Belgium in 1882.

The revenue from the telegraph in Belgium in 1882 was 2,674,804 fr., against expenditure of 3,525,502 fr., there being, therefore, a deficiency of 750,698 fr. The length of lines in kilometers was 5,851, against 5,693 in 1881, and of wire 26,074, against 25,404 in 1881. The number of employes was in 1882 2,473, against 2,454 in 1881. The following table shows the traffic during the years 1881 and 1882:

	TOTAL.	TRANSIT.	INTER-NATIONAL.	INLAND.
Messages forwarded in 1882	3,979,991	553,343	1,200,854	2,225,094
" 1881	3,791,402	494,791	1,199,155	2,097,456
Increase per cent. in 1882	4.96	11.83	0.14	6.08
Revenue in 1882	2,628,579	339,436	1,000,708	1,288,432
" 1881	2,658,069	322,039	1,036,956	1,299,072
Difference in 1882 against 1881	— 1.11	+ 5.40	— 3.50	— 0.82

Amongst the inland messages there were 62,752 urgent telegrams, 8,930 registered messages, and 6,988 telegraphic postal orders.

Magnetism of Thin Steel Plates.

A curious and instructive experiment has just been made by M. Duter, who took a number of very thin plates or discs of tempered steel, about a millimeter thick, and from five millimeters to forty centimeters wide, and built them into piles, the adjacent plates being sometimes in contact, and sometimes separated by a sheet of paper or cardboard. These piles were then inserted in a very powerful magnetic field, and withdrawn. It was then found that they had become powerful permanent magnets; but when the individual plates were separated they seemed to have lost their magnetism. On building up the pile again the original magnetism was restored to it. It appears then that the thin plates have not really lost their polarity on being withdrawn from the exciting field. Some of Professor D. E. Hughes's recent experiments have a great similarity to M. Duter's.

It is generally understood, our Baltimore correspondent says, that the telegraphic pooling arrangements between the Bankers and Merchants', Baltimore and Ohio, and the Postal Telegraph companies have come to a sudden termination, by the Bankers and Merchants' Company withdrawing. The entire plant of the B. and M., which had been moved into the Baltimore and Ohio building, has been replaced in the B. and M. old quarters, and all the wires are being cut out from the Baltimore and Ohio building. The rumors in telegraphic circles is that the Western Union has a finger in the break up. The only expression to be got from the Baltimore and Ohio is the remark of Superintendent Selden that things are terribly mixed. It is believed that the B. and M., in a few weeks, will be in lively competition with the Baltimore and Ohio and Postal Telegraph companies.

The directors of the Western Union Telegraph Company on Wednesday received the report of the company's business for the quarter ending June 30, 1884. The meeting was fully attended, among the directors present being John Jacob Astor, Jay Gould, Russell Sage, Alonzo B. Cornell, Samuel Sloan, Erastus Wiman, John Pender, Norvin Green, Thos. T. Eckert, Frank Work, Geo. J. Gould, and Chauncy M. Depew. George J. Gould was elected vice-president of the company in place of the late Augustus Schell, and Samuel Sloan was elected a member of the executive committee.

The quarterly financial statement presented was as follows:

Surplus, April 1, 1884		$4,049,817 96
Net revenues, quarter ended June 30, 1884		1,651,379 21
Total		$5,701,197 17
Deducting appropriations for—		
Dividend of 1¼ per cent., paid July 15	$1,399,807 38	
Int. on bonded debt	123,920 90	
Sinking funds	20,000 00	—1,543,728 28
Leaves a surplus, July 1, 1884, of		$4,157,468 89
Net revenues, quarter ending Sept. 30, partly estimated		$1,750,000 00
Add surplus, July 1		4,157,468 89
Total		$5,907,468 89
From which appropriating for—		
Interest on bonded debt	$124,000	
Sinking funds	20,000	
Total	$144,000	
Less portion of the sinking fund for the bonds of 1900 returned to the company	40,000—	184,000 00
Total		$5,803,468 89
Dividend of 1¾ per cent.		1,399,810 00
Surplus		$4,403,658 89

A resolution was adopted declaring a dividend of 1¾ per cent. on the capital stock of the company, payable on and after Oct. 15. The annual meeting of the Western Union stockholders will be held on October 8. The stock transfer books will be closed for election purposes on the afternoon of Sept. 20.

A Delayed Message.

A rescript has been received in the case of C. H. Clement, of Salem, against the Western Union Telegraph Company. This is an action for damages for failure to forward an unrepeated message in 1880, by reason of which plaintiff was defaulted in a divorce libel. The case was tried before a jury in September, 1882, and a verdict of $43.61 was rendered. Both parties excepted, and by agreement of counsel the verdict was set aside and the case heard by the court, and a verdict of 25 cents was given. Plaintiff took exceptions, which are now overruled, on the ground that the agreement was that the company is not liable beyond the amount paid for sending the message. Plaintiff gets 25 cents and interest from May 5, 1880, and defendant gets costs from date of tender of judgment in 1880.

It is reported that the French railway companies are trying the American electrical barriers for level crossings. They are in a normal condition set across the lines, thus allowing the street traffic to be carried on; but, on the approach of a train, the locomotive wheels pass over a contact, and close a circuit which causes the barriers to shut off the street traffic and give passage to the trains, at the same time warning the public by the continuous ringing of a bell.

The Report of the French Postmaster-General.

The very lengthy report issued by M. Cochery contains amongst other matters of interest, a brief review of the foreign Postal service. In Germany, says the report, where the fusion of the postoffice and the telegraph exists since 1875, the department is administered by a high functionary directly under the Chancellor of the Empire. From 1876 to 1883 more than 32,000,000 fr. have been put down in the budget for purchases of sites and construction of post and telegraph offices. The staff of the German post office is more numerous than the French, as already in 1880 it numbered 63,413 employes. In England the fusion took place naturally, at the moment when the Government put an end to the private telegraph service. The technical service is, as in France, confided to electrical engineers. In Belgium the post office and the telegraph are under one Director-General, but the two services form different departments. Combined post and telegraph offices exist only in certain cities, in others telegraph offices are opened at railway stations, and the post offices are established separately. In Austria the Director-General of Posts and Telegraphs is under the Minister of Commerce. In Denmark the administration of the post office, the telegraph, and the railways form the second division of the Ministry of the Interior, and is administered by a Director-General. In Spain the Director-General of Posts and Telegraphs is under the Ministry of the Interior. The two services are about being united. In Portugal the Director of the Posts, Telegraphs, and Light-towers is under the Ministry of Public Works, Commerce and Industry. The services have been united since July 7, 1880. In Switzerland the postal department is administered by a member of the Federal Council, who also presides over the telegraph service. In Italy a Director-General of the Post Office and a Director of the Telegraph are both of them under the Ministry of Public Works. It is, however, intended to unite the services. In the Netherlands the post office and telegraphs form two directions attached to the Minister of Finance. In Russia the two services have just been united.

Submarine Cables.

The Faraday is now engaged in laying the second Bennett-Mackay Atlantic cable from Kenmare Bay in Ireland to Canso in America. Dr. Muirhead is at present at the Irish station fitting up his duplex system on the cable already laid, and we understand that he will shortly proceed to America to complete the work there. With both the new cables duplexed, the company will have practically four cables at their disposal to compete with the existing lines.

Telegraphing in Chinese cannot be done in the same manner as any other tongue. Owing to the peculiarity of the Chinese character, each of which represents a word, the Danish Telegraph Company (the great Northern), working the new Chinese lines, has adopted the following device. There are from five thousand to six thousand characters or words in ordinary Chinese language, and the company have provided a wooden block of type for each of these. On one end of this block the character is cut or stamped, but on the other end is a number representing the character. The operator receives the message in numbers and takes the block of each number transmitted and stamps with the other end the proper Chinese character on the message form. Thus a Chinese message sent in figures is translated into Chinese characters again and forwarded to its destination. The sending operator, of course, requires to know the numeral equivalent of the characters or have them found for him.

Old Cable Stories Retold.

THE CAGLIARA, MALTA, AND CORFU CABLES.

I ended my last article on the Atlantic Expedition of 1857 rather abruptly. I cannot help adding a few general remarks here. First, as regards the melting of the guttapercha at East Greenwich, it seems to me this never should have been allowed to take place. That a cable exposed to the rays of the sun ran considerable risk was so well known to me that I always, when landing cable at Lowestoft, covered it with a thick layer of hay, and had water pumped over it to keep the hay wet and cool by evaporation, and this work of pumping water over the hay was the only work carried on by our men on Sundays when in harbor. But there was another danger which the Atlantic cable incurred. The cable was passed through tanks of hot Stockholm tar; these tanks were heated by jets of gas under them. On my first visit to Messrs. Glass and Elliot's yard I arrived there at dinner hour, and found the cable leading from some six or seven machines, which were stopped, still in the tar tanks, and although the gas was turned down the tanks were quite hot to the hand, and must have been at a temperature considerably above blood heat. I was greatly astonished, and wrote to Mr. Bright, and received a note thanking me for the information, and saying it should be attended to. Who was responsible for the hot tar tanks, or the exposure of the cable to the sun? Was it the contractors or the company?

As regards the paying-out gear, it was designed by Mr. Bright and Mr. De Bergue, and I was told, on commencing to criticise the drawings, that nothing could be altered except the size of the V sheaves. That machine, although it was very ingenious in some respects, has never been used since, and it was an entire departure from what had been previously used. Indeed, the machine made for the 1858 expedition (which consisted of two independent drums with four or five V scores on each) has never been repeated. A return has been made to the drum and knife machine as used on the earlier cables, in some cases, it is true, with the "Appold" (or rather "Amos") brake, and in some cases with the ordinary brake straps arranged in various ways as regards the manner in which the strap is attached to the lever, or is attached to the frame. But this subject could not be discussed without diagrams.

Passing on to history, or rather personal experience, the Atlantic Company had to reduce expenses, and as I had only an agreement which expired with the failure of the 1857 expedition, whilst the other three engineers had agreements which bound the company to keep them on till the completion of the cable, I had to look out for other work, and was engaged by Messrs. Newall & Co., who had engaged to lay the Cagliari, Malta and Corfu cables, and had also to complete a four-conductor cable which they had attempted to lay between Bona (in Algeria) and Chia Bay, near Cape Spartivento, the extreme southern point of the Island of Sardinia. The cable had been laid to within about fifteen miles of Chia, when they ran short of four-conductor cable. They therefore spliced on some ten miles of single wire cable which they had on board, and paid out till that ran short, and the end was let go a few miles from Cape Spartivento.

On October 21st, 1857, I started for Marseilles with Mr. Newall, and arrived there on the 23d. The Liverpool steam tug Blazer (Captain Parry) was there, and the brake, eight feet in diameter, was being fitted on the quarter-deck. There was a length of twenty miles of four-conductor cable in a circular wooden structure in the hold, with proper cone and rings. We went on board on the evening of the 24th, and were about to start when there was a delay caused by a young Frenchman, who had to receive payment for the coal which had just been placed on board. Mr. Newall had naturally drawn a bill on his own firm for the amount of the coal bill, but the young Frenchman wanted, I suppose for some particular personal profit of his own, to get a part of the sum paid in gold, and began by asking for a portion of the payment in gold. This was refused. He then began lowering his terms as regards the amount of gold, but in proportion as his terms lowered, his temper, or pretence of temper, increased. When he had got down to about £75 in gold, he was stamping about the cabin. I was translating the conversation between him and Mr. Newall, who was reclining on a sofa. At last the Frenchman began the trial of taunts. "*Comment*," he said, "*des gen-tel-mans, voyageant comme vous, vous n'avez pas meme cinquante livres en or.*" I translated this. "I wish I had him down a coal mine in the north," said Mr. Newall, *sotto voce*, and stroking his beard to keep his temper. I am afraid there would have been very little left of the Frenchman if Mr Newall had had his wish. The little Frenchman, finding even his final grand taunt useless, gradually subsided, and carried away his bill, which, it is almost needless to remark, was his full and proper payment, and indeed it was not likely that Mr. Newall would use the £150 in gold which he had provided on board for petty expenses at hotels, boats, etc., in paying coal bills. To carry gold enough to pay coal bills in telegraph expeditions would nearly sink a ship.

We went over to Bona, arriving on the 27th, and left there one of Messrs. Siemens' staff, with an induction coil instrument to speak to us when we hooked the cable off Spartivento. We started back same night for Spartivento, and arrived there on morning of 28th, and dredged without success for the cable. We had no picking-up gear of any kind, and no bow sheave, but I rigged up a temporary bow sheave. The next day (29th) we grappled again, got cable one mile from end, hove it up, cut it, and buoyed the short piece, and then hauled in the other nine miles by hand, came to four-conductor cable, and made splice during night on to cable on board. The next morning (30th) we paid out towards shore, and landed the end.

I landed to bathe for the first time in Italian waters, and I was all alone. I was always devotedly fond of Italian opera, and seeing a strange gentleman, with long black moustache and piercing black eyes (who I soon knew afterward as the Chevalier Franchesi, in charge of the telegraph) advancing toward me on the sea beach, I felt that now or never was the time to make use of some of the phrases I had gathered from the recitatives and duets in Italian operas. Taking my cap off and bowing in as near approach as I could to the exquisitely graceful bows I had seen the late Signor Mario make to various queens and kings in "The Huguenots," "Favorita," etc., I began boldly with "Salute Signore." "Aha! parlate Italiano," said Signor Franchesi, delighted, and he launched forth in the purest Italian—for he was of an old Milanese family—a torrent of the "soft, bastard Latin" that made me ignominiously cry for quarter by asking, "Vous parlez Francais, Monsieur?" and I had to take to that useful language for the rest of our acquaintance. But I was intent on recognizing anything I could in the way of Italian that I was at all familiar with, and I can well recollect that the only words that struck me as familiar were when Signor Franchesi, seated before a double-needle instrument in the open air, with a colored hankerchief over his head to keep away the mosquitoes, and trying to speak to Cagliari with a failing battery, suddenly exclaimed, "Sacrrremento!! mi manca la pila." I was ot once reminded of "Mi manca la voce!" in "Semiramide," and reflected on the difference in the situation, and what would have been the effect on the audience if that energetic "Sacrrremento!" had prefaced the words in the celebrated quartet?

On the 31st we left for Cagliari, where Messrs. Newall's ship Elba, with the cable to be laid between Cagliari, Malta and Corfu, was to meet us. We arrived there in the middle of the night, landed, and were making our way quietly up the solitary streets when we were fetched back by gendarmes, and placed in a kind of cage, like wild beasts, on account of sanitary ideas, until the captain was fetched from the ship, and certain papers were examined. We were at last released, and then had to knock for about an hour at the Hotel della Concordia to gain admittance, as nobody was expected at that hour from anywhere.—*F. C. Webb, London Electrician.*

The American Bell Telephone Company will pay the usual $3 quarterly dividend Oct. 15.

We shall publish in our next week's issue the balance of the Telephone Convention Proceedings unavoidably crowded out of this edition.

"Down with the telegraph poles" is the cry in the cities. But away off at the Far West, on the boundless plains where cattle roam, beeves and kine, could they speak, would echo in spirit the pious ejaculations of the Highlanders with the Scotch fiddle, changing "God bless the Duke of Argyle" into "Long life to the U. P. R. R. Co." The polished bases of the telegraph poles attest how thoroughly the itching cattle have appreciated their excellence as scratching posts. As the comforting qualities of the poles are now lost in consequence of their acquired glossy surface, it behooves the Society for the Prevention, and so forth, to send out men with tools to restore the scratching area on the poles.

Telephonic Communication for Mons, Belgium.

The town of Mons is about to be provided with a complete telephone system, in conformity with a convention made in June, 1883, between the Municipality and M. Van Hulle, of Brussels. The latter has given up his rights to M. Kahn, who has entrusted the direction of the work to M. Roder, engineer. The town authorities have given a building for the central office, and also the exclusive right to carry wires over the communal buildings and the less important roads, the Hotel de Ville, the belfry of the Chateau and the Collegiate Church of Sainte Waudru being excepted. The concessionaire undertakes to provide twelve gratuitous services for the Municipality, and to accord a reduction of 35 per cent. on the subscriptions of establishments under the control of the City and Provincial Authorities and the Government. The subscription of 150fr. (£6) per annum, is to be reduced by 140fr. (£5 12s.) when the subscriptions exceed 400. The central office, situate in the Rue de la Peine Perdue (*absit omen*) is already arranged for 450 communications. The overhead wires of galvanized steel, fully two millimeters in diameter, are hung on timber frames capable of carrying 100, 140, and even 150 wires. The porcelain insulators are of the type adopted in Switzerland for telephone lines. For lines of long distance, from the central office to the railway station, for instance, the wires are of phosphor bronze, and they are hung on posts. Two tables of communication for fifty subscribers are already placed in the central office. The instruments hitherto fixed in the houses, etc., of the subscribers are carbon transmitters of a type nearly resembling the Crossley or the Ader. Williams's magneto calls are used, fixed on boards, and placed underneath the transmitters. The batteries for actuating the microphones are Leclanche cells with porous vases on connected plates. As a rule, three batteries are reckoned for each subscriber. All the installations have been made with the greatest care, and mainly in view of the great increase of long-distance telephonic communications which is likely soon to take place in Belgium. Like the other chief towns of provinces Mons will be one of the first to be provided with all the instruments included in the Van Rysselberghe system, which will shortly permit the manufacturers and colliery-holders of the Borinage [the local name given to the district, otherwise known as the "Couchant (West) de Mons," where the most valuable coal is extracted] to communicate by telephone not only with Brussels and Antwerp, but also with Charleroi, Liege, Verviers, etc.—*Bulletin de la Societe Belge d'Electriciens.*

TELEGRAPHIC

.... At the Electrical Exhibition in Philadelphia was shown a piece of the first submarine cable ever laid. It came from the line laid between Dover and Calais in 1851.

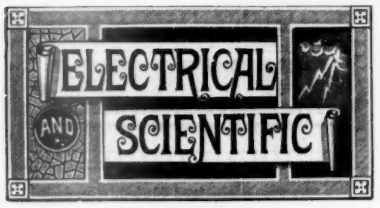
.... The Western Union Telegraph Company is said to have renewed a long-time contract with the C. B. & Q. Telegraph Company, and has begun the operation of the lines from Chicago to St. Paul, which it recently secured.

.... James Partrick, a well-known electrician, and senior member of the firm of Partrick & Carter, of Philadelphia, dealers in electrical supplies, died on Sunday at Atlantic City. He was authority on electrical subjects, and was well known throughout the country.

.... It is again claimed that a telegraphic short-hand has been invented by Signor Michela, which has been for some time in use in the Italian Senate and is now on an experimental trial in Paris. It works on the phonetic system, by which the sounds that go to make up the speech in any language are grouped into series, and represented by certain signs. This obviates the necessity of a signal for every letter in a word, as is now the case.

.... The Gold and Stock Telegraph Company threatened some time ago to remove a "ticker" from the office of Ellis Morris, No. 47 Montgomery Street, Jersey City. Morris obtained in the Supreme Court here a preliminary injunction restraining its removal. The company sought to have this injunction dissolved on affidavits setting forth that it had leased the "ticker" to Morris on condition that he would use it only for his own business; that he kept it in a room in Jersey City occupied only by a telegraph operator, and that from this room a private wire ran to New York. The inference from these facts was that Morris furnished to "bucket shops" in this city the stock quotations, etc., received by him in Jersey City. The company's attorney also claimed that it had a right to take the "ticker" because Morris had not paid the rent for it. Judge Van Brunt decided that there was no legal evidence of a violation by Morris of his contract, but only a mere suspicion, on which a legal judgment could not be founded. He therefore denied the motion to dissolve the preliminary injunction on the first ground, but said he would dissolve it on the second ground unless Morris paid the overdue rent of the "ticker" within five days.

.... The Western Union is scandalized because it is being underbid for its Government business. It protests against being "forced" to accept Government telegrams at the low rates offered by the United Telegraph lines. Well, who is "forcing" the Western Union to take what it does not want and need not take? If any one is intimidating Gould and others, the police ought to interfere. The real trouble is, however, beyond the reach of the police. A load of eighty million dollars of capital, nearly one-half of which is "water," cannot be easily sustained in the face of active and effective competition. Telegraphy has never been placed within the reach of the masses because it has been made to serve the ends of unscrupulous stock jobbers and speculators intent upon working it for all it is worth. Cheap telegraphy was, until very recently, unknown among us, and it will be the people's fault if they do not now secure that boon. The Western Union need not die, and probably will not. But its managers ought to accept the inevitable, and conform their business to new conditions that arise. That company need not take Government telegrams if it does not want them. The United lines will accept them. In thus squealing, the Western Union shows what a pressure is being brought to bear upon it. In the end the public will gain.—*New York Herald.*



* * A project is on foot for providing Naples, Italy, with an underground railway, the tunnels of which it is proposed to light throughout by means of electricity.

* * It is reported that the French railway companies are trying the American electrical barriers for level crossings. They are in a normal condition set across the lines, thus allowing the street traffic to be carried on; but, on the approach of a train, the locomotive wheels pass over a contact, and close a circuit, which causes the barriers to shut off the street traffic and give passage to the trains, at the same time warning the public by the continuous ringing of a bell.

* * The Electrical Commission at Philadelphia passed the following resolution on Saturday: "That this conference deems it of national importance that Congress, in pursuance of its constitutional authority to fix a standard of weights and measures, should fix standards of electrical measures, and, in order to secure the use of such standards, should establish a bureau charged with the duty of examining and verifying instruments for electrical and other physical measurements."

* * At the session of the United States Electrical Commission, Prof. Abbe stated that the committee on atmospheric electricity had thoroughly considered the questions of earth currents and the desirability of co-operating with the signal service, with a view to rendering that department of even more use to the public than it is at present. A motion was then carried to the effect that the conference make the proper overtures to the next Congress for the purpose of legalizing, through the officers of the present conference, the co-operation of that body to extend the signal service.

* * The resistance of ice has been measured by M. G. Foussereau. He says he determined the resistances of ice made from distilled water by taking for electrodes two thin cylindrical and concentric plates of platinum. He found the resistance became 15,000 times greater at the moment of congelation. The specific resistances varied from 4,865 megs. at – 1 deg. C. to 53,540 megs. at – 17 deg. C. "I found also," he says, "that the resistance of ice varies with the nature of the water from which it is made. A sample of town water 65 times better conductor than the distilled water previously mentioned gave ice conducting 30 or 40 times better."

* * The reports of the President and Treasurer of Cornell University just issued for the year ending Aug. 1, 1884, contain several items of public interest. President White reports that the whole number of instructors in the university is 54; whole number of students during the year, 461; an increase of 77 in two years. Of these 414 are men and 47 women. There are 15 courses of study, those in the arts and sciences being most patronized. There were 176 State students during the year instructed free of charge. The university library contains, including pamphlets, 65,500 volumes, and is constantly being enlarged. The President refers at length to the new scholarships and fellowship which go into effect on Sept. 18. Thirty-six scholarships, each worth $200 per annum, will be awarded for the best entrance examinations. Fellowships, six in number, are to be awarded to worthy post graduates, each fellowship being worth $400 per annum. Treasurer Williams reports the productive endowment of the university to be $3,700,000; the value of the university property, excluding the Fiske estate, now in the courts, to Western lands is $4,900,000; total value of university property, $7,300,000; total income during the year, $217,700; surplus, about $5,000. The university was never in so prosperous a condition.

* * All who attend the Electrical Exhibition are lost in admiration at the thousand and one things to which electricity has been applied. The opinion is shared by everybody that it is really a great and wonderful show, and no one should fail to see it.

Dr. Wahl, the Chairman of the Committee on Lectures, states that he had secured the following professional gentlemen to lecture on Tuesdays and Thursdays in addition to Professor Forbes and Dr. Raymond: Professor George F. Barker, of the University of Pennsylvania; Professor C. A. Young, of Princeton College; ex-President of the American Association for the Advancement of Science, Professor Charles F. Hines, of Dickinson College; Professor Harrison Allen, of the University of Pennsylvania, and Lieutenant Allen, of the United States Signal Service.

* * A new voltaic battery has been brought out by M. Tommasi and M. Radiguet, in which peroxide of lead surrounds the carbon plate as it lies on the bottom of the cell. The other plate is also of carbon, covered with fragments of retort carbon platinized. The two plates are placed one above the other, but separated by a sheet of parchment paper which divides the containing vessel into two compartments. A saturated solution of chloride of sodium or common salt is filled into both compartments until the upper carbon fragments are partly immersed in it. The electromotive force is 0.6 volt. The negative pole is that carbon plate which is not in contact with the peroxide of lead. If other saline solutions, such as sulphate of ammonia, sulphate of soda, chlorhydrate of ammonia, or even dilute sulphuric acid, be used instead of the solution of salt, the electromotive force does not sensibly vary.

* * The visitors to the Philadelphia Electrical Exhibition will find a new feature, one of peculiar interest, that is the United States Government Patent Office display. It is in charge of Mr. J. M. Churchill, of the Washington office.

"The Patent Office," has often been spoken of as a massive sepulchre of the shattered hopes of some of the most brilliant intellects. This is especially true of the army of workers in the electric field. The buildings at Washington are stored with models of alleged inventions in electricity. Some of them are of the most visionary character.

The display comprises about two hundred and fifty separate pieces; some of these are of particular historic importance. Here is the pride of the exhibit. The original Morse invention of telegraphic apparatus, patented April 11, 1846. The transmitter is mounted on a pine block and is very crude. The armatures are wound with very coarse and poorly insulated wire, and the sounder consists of an ordinary piece of stick which strikes against a piece of iron. The clock work which operates the cylinder, about which the perforated paper was wrapped, is of a more improved pattern. On the card attached to the exhibit is the following, said to be an effusion of a clerk at the Washington office:

"The steed called Lightning," says the fates,
"Was tamed in the United States.
'Twas *Franklin's* hand that caught the horse
That was harnessed by Professor *Morse*."

* * It has long been a recognized fact that iron, when subjected to repeated blows and shocks, obtained permanent magnetic qualities. Soft iron of a pure quality is affected very little in this way, but impure wrought and cut irons are capable of being permanently magnetized to a very appreciable extent. As early as the year 1600 Gilbert experimented in this direction by placing bars of iron in the magnetic meridian, and striking them with a hammer. It would require very little imagination, therefore, to suppose that in a busy city, containing iron structures of all kinds, the latter should possess magnetic qualities, since they are constantly exposed to shocks and vibrations caused by traffic. Some one has been investigating the L roads in New York, the Brooklyn Bridge, and other iron structures. Not only the nails, but the supporting iron columns, were found to be magnetic, it is said, as were also the columns supporting buildings, and the trusses connecting the posts. The Brooklyn Bridge is a huge magnet, cables and all. The cast-iron fronts are also magnetic, the north poles at the ground and the south poles at the top; and the lamp posts about town showed marked magnetic properties, as did also the hydrants. In buildings heated by steam the radiators were all found to be magnetized, with north polarity at the bottom. The investigator thinks the existence of such large quantities of magnetized iron, in thickly-inhabited sections, may affect the health of the people, but, if anything, the result would be beneficial. It may also have some influence over the weather, but this yet remains to be proved.

The Elements of Electric Light Engineering.

Mr. Crawley, in a communication to the London *Electrician* on above subject, says that before starting a dynamo machine the collector or commutator should be well examined to see that it is properly clean; if not, it should be cleaned by rubbing it with a piece of linen rag, and then it should be just touched with oil (preferably lard oil) by holding an oily pad of clean wash-leather lightly against it when rotating. This ought to be done several times in the course of the day if the machine be running continuously. In the case of the Brush dynamo it should be done every half hour or hour. The brushes must be looked to; they should press evenly and firmly against the collector, but ought not to be screwed against it too tightly, or they will wear out very fast. When this happens, and they become ragged and uneven, they should be taken off, trimmed with a pair of shears, and then replaced. In putting the slit metal brushes on the Brush machine they should be clamped in the brush holders, so that when the machine is turned against the brushes the edges of the air insulation spaces on the commutator just do not catch the forward edges of the brushes.

See that the lubricators for the bearings are well supplied with oil before starting, and are in good working order, and that there is nothing lying about that may catch in the armature when revolving. If on starting the machine and turning on the current there is much sparking at the brushes, it shows that their lead is wrong, and they must either be advanced slightly in the direction of rotation, or *vice versa*, until the sparking is reduced to a minimum. In some machines the brush holders are mounted on a rocking arrangement, and so can be easily shifted when the machine is running; in the others the shifting must be done by putting the brushes further in or out of their holders.

When the current that a machine is generating is increased or diminished, increased sparking will probably be seen at the brushes, necessitating an alteration of the lead; as a general rule, if the current be increased the lead must be also increased, *i. e.*, the brushes must be slightly advanced in the direction of rotation, and *vice versa*.

In altering the lead on a Brush machine where there are two or three pairs of brushes, each pair on a separate rocking arrangement, the first pair should be shifted very slightly forward or backward, as the case may be, then the next pair in the same manner, and, if there are three pairs, the third; then the first again, and so on, until all the pairs have the proper lead.

As we have several times mentioned the Brush machine without having described it, we shall now do so. The armature of this dynamo consists of a ring with projecting teeth, between which the coils are wound. There are eight of these coils, the inner end of four of which is joined to the inner end of the one diametrically opposite to it, while the outer ends are brought to the various segments of the commutators, of which there are two or three. When the machine is working, one pair of coils—that in the least useful part of the field (*i. e.*, when the rate of change of the lines of force passing through them is a minimum)—is cut out of action. The pair of coils at right angles to these, which is in the most useful part of the field, is in contact with one pair of brushes, while the other two pairs of coils, which are neither in their best nor worst positions, are joined together in parallel are between the other pair of brushes.

The New Orleans Exposition.

The Southern Exposition, which is to be opened at New Orleans on December 1, is the outgrowth of an idea that originated in 1879, when the Mississippi Cotton Planters' Association was organized with a view to meet the desperate state of things then threatening the planting interest by the proposed exodus of the colored population, and the apparent necessity for replacing the old methods of raising cotton by new methods and labor-saving machinery. The association embraced planters from Texas, Mississippi, Arkansas, and Louisiana—representative men who comprehended the importance of immediate action.

The first result of this association was the development of a plan by D. F. Kenner, Commissioner of Agriculture for Louisiana, and F. C. Morehead, president of the Cotton Planters' Association, for an exposition in 1880, with the object of calling the attention of agriculturists and others in the South to improved methods of treating the land and to new agricultural appliances. The negroes had been taken with the idea of "exodusting," and the planters were ready to the almost anything.

Correspondence with Edward Atkinson and others, who took great interest in the idea, resulted in the memorable exposition at Atlanta, which proved a revelation and a means of education to the Southern planters. It was an object lesson of the first class, easily comprehended. The many practica illustrations of what could be done in the way of improved cotton planting led to widespread results. For instance, Benjamin S. Rocks, a well-known planter of Yazoo, said he found that labor-saving invents, which he began at once to use on a cotton plantation of two thousand bales capacity, made a saving of 25 per cent. Other representative planters gave similar testimony.

But the Atlanta exposition was but a primary school for technical education compared with what is proposed in the New Orleans Exposition, which is intended to be a sort of college to teach the applied science of agriculture. The idea that the Atlanta show could not only be equaled, but eclipsed, soon obtained favor, and at a great gathering of agriculturists in October, 1882, the preliminary steps to the New Orleans Exposition were taken. It was then arranged that the exposition should embrace everything that is calculated to diversify southern industries, and bring together the landowners and farmers of the South and the machinery makers and capitalists of the North. It was determined that the exposition should be under the auspices of the Cotton Planters' Association, embracing all the Southern States, and that it should be located in such city as the executive committee thought offered the largest inducements. Mr. Morehead was instructed to go to Washington and ask in behalf of the enterprise concessions from Congress similar to those granted to the Centennial Exposition at Philadelphia.

The New Orleans Exposition is, in fact, a sort of centennial celebration of the beginning of the cotton industry in this country, as the first cotton was exported in 1784. This was the beginning of the great export trade that has made American cotton an important factor in the industry of the world. The year 1884 also marks the hundredth anniversary of the peace that closed the Revolutionary war, and it was thought fitting that the occasion should be made memorable by the exposition of the arts of peace. It was also considered that the South had been the arena of the most remarkable industrial progress of this decade, and was, therefore, the proper center for such a celebration.

The coming exposition is called the World's Industrial and Cotton Centennial Exposition, and it is to be held under the auspices of the United States and the National Planters' Association. On April 24,

1883, the executive committee selected New Orleans as the site for the exposition. Congress approved the charter constituting a board of thirteen members, six of whom are appointed by the President, and seven on the recommendation of the association and subscribers.

Under the act, the commissioners of the exposition had the authority to invite foreign governments to participate in the exposition. In order to make provision for the guests thus invited, an act of Congress was passed loaning $1,000,000 to the enterprise, on the same plan that proved successful with the Centennial Exposition at Philadelphia. Louisiana and New Orleans raised $700,000 by State and city appropriations and private effort, and from various sources funds amounting to about $1,500,000 more were raised to help on the enterprise.

Then the plan was enlarged a little, and the federal government decided to ask foreigners to bring exhibits relating to the departmental workings of their governments as a contribution to the knowledge of the science of government. To carry out this idea, a supplementary appropriation of $300,000 was made by Congress, and a board of officers was appointed by the President.

When the enterprise was started, one of the most active promoters was Señor Diaz, now President of Mexico. President Diaz has not lost interest in the exhibition, and promises continued co-operation. Already the Mexican government has appropriated $200,000 for its share in the great show. The Latin countries of Central America will also be duly represented at the exposition. Although, on account of the use of the term Southern Exposition, many have supposed that it will be solely an exhibition of Southern products and things having no relation to them, the fact is it will be an international exhibition on a larger scale than any heretofore attempted anywhere.

The grounds cover 250 acres. The main building is the largest ever built for such a purpose. The government building measures 884 by 565 feet, and is itself larger than either of the two Paris exposition buildings, and larger than the Vienna exposition building. There will be an immense horticultural hall, art galleries, and other buildings, such as naturally cluster around a great exposition. The intention is to provide room for all exhibitors who have anything to show that is worth seeing. The exhibits are to be catalogued in nine groups, with about one thousand classifications. The prime object of the exposition is to educate the people, and this will be kept constantly in view. The president of the exposition is Edmund Richardson, of Mississippi, the largest cotton planter in the world. The director-general is Maj. E. A. Burke, of New Orleans. There is an office in New York in the Stewart Building, at Chambers Street and Broadway, and another office in Chicago. Then there is a commissioner in every State, with $5,000 to spend in the interest of the exposition. There are also fourteen men traveling in Europe giving information about the exposition and getting exhibitors.

The exhibition will be opened promptly on December 1. Already a fleet of steamboats is being prepared on the Mississippi to take visitors to the show. There are ten lines of steamers connecting New Orleans with New York. Then there are the Louisville and Nashville Railroad, the Queen and Crescent Railroad, the Illinois Central, the Louisville, New Orleans and Texas, and the new system of Mexican roads ready to carry visitors from all directions to the exposition, and the prospect is that even in the number of its visitors the Southern Exposition will rival the exhibition at Philadelphia.

On Hall's Phenomenon in Liquids.

According to M. Anton Roiti, Hall has shown that when a current is passed through a thin plate of metal, there is a transverse E. M. F. induced in the plate, if it is placed with its plane perpendicular to the lines of force of a magnetic field. This is the phenomenon suggested as possible by Maxwell, and expressed by the assumption of a "rotatory coefficient" in the equations of conduction. Hall has determined this coefficient for various metals. The author first experimented with a sheet of silver electrolytically deposited on glass, and in general verified Hall's results. The experiment was then tried in a different way. The main current was passed through a silver wire, *A B*, 0.03 millimeter in diameter, and about 4 centimeters long, held by two stout copper wires. At right angles to this was a second similar silver wire, *C D*, forming a cross with the first. This second wire was stretched by two suspended weights, and had stout copper wires similarly attached to it. The plane of the wires was at right angles to the lines of magnetic force, their point of intersection being in the axis of the electro-magnets. The copper terminals of *C D* were connected with an exceedingly sensitive galvanometer. It was found that if the tension of the wire was considerable, no effect whatever could be observed when the direction of the field was reversed, even with a primary current produced by six Daniell's. This shows that the supposition of a direct effect upon the current is not admissible, and that the phenomenon really depends upon a change in the specific resistance, in the manner considered by Maxwell. In experimenting on liquids, the author found that the polarization introduced considerable difficulties, but he concludes from experiments with sulphate of zinc solution, that if the concentration of the solution is less than that of maximum electrical conductivity (specific gravity 1.286), the electro-dynamic action produces an increase in the conductivity of the liquid in the direction of *C D*, and conversely if the concentration is greater than that of maximum conductivity.—*Institute of Civil Engineers' Transactions.*

The Western Edison Light Company, of 51 and 53 Wabash avenue, Chicago, have completed the additions to their Incandescent Electric Light plant at Haverly's Theater. The plant now consists of one 350-light dynamo for lighting the stage and dressing rooms, and one 300-light dynamo for lighting the auditorium. These machines are driven by an Armington & Sims single disc engine 12½"x20", running at 180 revolutions per minute. There is also another dynamo of 250 lights capacity for lighting the Foyer Art Galleries, entrances, hallways, etc. The wiring is so arranged that this 250-light dynamo can be instantly connected with either or both of the other circuits for the purpose of lighting any part of the house during the day for cleaning, etc., thus dispensing with gas entirely. An Armington & Sims engine 9½"x12", running at 300 revolutions per minute, is used to drive this machine. This arrangement admits of the use of electric light in the house at all times and at very moderate expense, as steam is kept on at least one boiler at all times for elevator use, and the only expense is the small additional quantity of coal consumed. Besides the machinery named there is a complete system of switches for turning on and off groups of lights and regulators for controlling the candle power of the lamps in these groups so that any number of lamps may be burned, from a dull red color through all the different gradations of light up to the brightest incandescence. This regulating apparatus is placed on the stage at the prompt stand and occupies a space of 12 inches deep, 3 feet wide and 3 feet high. The stage lighting is a study in itself.

There are groups of lights arranged with reflectors overhead in such a manner that they can be changed in position to suit the scene to be lighted. There are also the usual foot lights and groups of special lights that can be moved to any place on the stage, for the purpose of destroying shadows and for bringing strong light on some particular point in a scene. All of these lights are under the control of the man at the regulating apparatus There are also arrangements for producing sunset and lightning effects.

—— The city of Akron, O., is shortly to be lighted by 150 Thomson-Houston arc lights under the new contract made with the Thomson-Houston Electric Co. Quincy, Ill , has also contracted to increase its public lights of the same system to 115, and in Syracuse the whole number of Thomson-Houston arc lights has risen to 200.

—— The Thomson-Houston Electric Light Company, of Philadelphia, Mr. E. D. Mullen, manager, has installed a large number of important electric lighting plants of the Thomson-Houston system in the last few months. Among the largest concerns in Pennsylvania who have been supplied in this way are the Midvale Steel Works, Nicetown; the Pheonix Iron Company, Pheonixville; the Lackawanna Iron and Steel Company, Scranton; the Chester Rolling Mills, Chester; the Cambria Iron Company, Johnstown; the Keystone Bridge Company, Pittsburgh; the Baldwin Locomotive Works, the Delaware Rolling Mills, the American Shipbuilding Company, W. C. Allison & Sons' Car Shops, Ellithorpe & Co. Knitting Mills, Philadelphia; the Philadelphia and Reading Railroad Company, Reading; and the Cumberland Valley Railroad Company, Chambersburg. The Edgemore Iron Company, Wilmington, Del.; and the Baltimore and Ohio Railroad Company, Baltimore, Md., have also introduced the same lights. The energy and ability of Mr. Mullen in pushing these lights into successful operation in his territory is worthy of commendation.

—— At the Electrical Conference the committee on the standard unit for light reported informally through the chairman, Prof. Trowbridge, that in the opinion of the committee the standard unit of light proposed by the Paris conference was impracticable, and that they did not believe its adoption advisable in this country. He called upon one of his colleagues, Mr. Preece, who had prepared some statements.

[The standard unit of light here referred to is that amount of light of the same character as the light to be examined, which is emitted from the surface of one square centimeter of melted platinum at the temperature of solidification].

Mr. Preece said that he had devoted much time to the study of the measurement of light as a member of a committee of the British Association. Two points are necessary to be considered. First, the formation of a practical standard for all lights; and second, the accurate definition of the standard of white light. The first of these is practically all that is necessary to examine. After referring to the personal equation of the individual observer, he went on to consider the systems which are legal in the various countries. In England they have a standard sperm candle of certain quality and burning 120 grams per hour. In Germany they have a different standard candle. In France they use a lamp known as the Carcel, which represents about 9.7 of the British standard candle power. Mr. Preece believed that all of these were defective, because they did not relate to the illuminating power, the important point of the light. He had proposed as a standard the light given off from a perfectly white surface when the light from a British standard candle fell upon it from a distance of 12.7 inches. This would correspond to the amount of light given off when the same surface was illuminated by a Carcel lamp at the distance of one meter. He thought the practical method of comparing and studying the three points, the standard of light, the standard of illumination, and the means of photometric measurements were best found in the incandescent electric lamp. It was convenient and accurate, and could always be reproduced. He promised further aid to the committee until their report to the commission should be rendered.

Professor Koyle asked if the surface of incandescent platinum of a certain size would not be better than that of the carbon filament? Mr. Preece replied that in the air the surface of platinum had not been successful, and that sufficient experiments had not been conducted with platinum in vacuo.

ELECTRIC LIGHT NEWS

—— A petition of 270 signers (tax payers), was presented to the Board of Councilmen at New Haven, Conn., last week, asking that the central portion of the city be lighted with electric lights at once.

—— One of the most interesting parts of the Brush exhibit at the Philadelphia Exhibition is a 40-light storage battery, which is in practical use lighting incandescent lamps. The battery consists of 21 cells, each containing two 16-inch square cast lead plates in a dilute solution of sulphuric acid. In charging, high-tension electricity can be employed, and no switches need be used, as an automatic manipulator turns off the current as soon as the cells are fully charged, and turns it on again when more electricity is needed.

—— The Thomson-Houston Electric Company have shipped five dynamos and 125 arc lamps to the Baltimore and Ohio R. R. Company for its Mount Clare shops.

The Thomson-Houston lights were recently introduced by the McKeesport Electric Light Company, McKeesport, Pa.; the Germantown Electric Light Company, Germantown, Pa.; the Ashland Gas Light Company, Ashland, Pa.; the Conn Dist. Tel. and Elec. Company, Waterbury, Conn.; the Gloucester Electric Light Company, Gloucester, Mass., and by local companies in both the Eastern and Western districts of Brooklyn.

—— The United States Electric Light Company's exhibit at Philadelphia embraces the whole subject of electric lighting from the manufacture of incandescent carbon filaments and arc carbon rods to the complete fixtures furnishing light for a part of the building. A peculiarity of the system is that a bunch of incandescent lamps can be used in place of an arc light, and by subdivision of the high-tension current, on the same circuit in which arc lamps are burning. In such an incandescent side circuit, an automatic, alternating magnetic action on a pawl turns resistance coils on or off according to the number of lamps burning, and prevents their destruction by the high-tension current.

—— Dr. W. H Stone, F.R.S., has devised a pair of spectacles or eye protectors, for persons who are in the habit of working by or with electric light. The spectacles consist of front glasses of blue with attached side glasses of red glass. The danger to the eye from the incandescent lamp is likely to arise from the red or heat rays—that from the arc lamp is due to excess of blue or actinic rays, hence the use of two glasses. In looking at the incandescent light through the blue glasses, the glare is removed and irritation from the intense yellow and red rays prevented, while after folding down the red side glasses over the blue front ones, the arc light can be looked at with safety through the joint media. The tints of the glasses are selected and combined by help of the spectroscope.

—— An electric lighthouse has recently been erected on the island of Raza, at the entrance of the Bay of Rio Janeiro. The lighthouse proper is eighty-five feet high, and is put upon a rock 230 feet in height, so that the focus of the light of the apparatus is fixed at an elevation of 315 feet above the sea. The electric current is produced by a continuous current Gramme machine, working at the rate of 700 revolutions, and feeding a light of 2,000-candle power. The Gramme machine referred to is worked by a stationary surface-condensing steam engine, this arrangement being inevitable, owing to the want of fresh water. All the fittings are double so as to prevent interruptions by unforeseen accidents; and, to make assurance double sure, an oil lamp is always kept in readiness. The light is revolving, having two white disks and one red one, succeeding one another at fifteen minutes' interval, and the light is visible at a distance of about hirty-five statute miles.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPTEMBER 9, 1884.

304,699 Insulating device; George L. Bromhall, Paterson, N. J.

304,732 Circuit closer for burglar alarms; Albert Iske, Lancaster, Pa.

304,748 Mould for making glass insulators; Sam'l Oakman, Melrose, Mass.

304,759 Non-inductive electric cable; Mary E. Shaffer, New York, N. Y.

304,764 Dry pile; Jules Alphonse Thieboult, Paris, France.

304,843 Telephone ear-piece; William R. Miller, Baltimore, Md.

304,880 Manufacture of carbonizable material for the conductors of incandescent lamps; Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N Y.

304,881 Electrical meter; Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y.

304,882 System of electric lighting; Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York.N. Y.

304,883 System of electric lighting; Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y.

304,884 System of electric lighting; Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y.

304,897 Voltaic battery; Nicholas Basset, Paris, France.

304,901 Manufacture of Carbon filaments for incandescent lamps; George Bowron and Walter Hibbert, London, county of Middlesex, England.

304,907 Electrical meter; Charles L. Clarke. New York, N. Y., assignor to the Telemeter Company, Summit, N J.

304,908 Electric indicating device for elevators; Charles L. Clarke, New York, N Y, assignor to the Telemeter Company, same place.

304,966 Electric arc lamp; Elmer A. Sperry, Cortland, N. Y.

304,989 Anti-incrustator for steam boilers; Sam'l G. Cabell, Washington, D C. assignor to Milton S. Cabell, Quincy, Ill., and Flora B. Cabell.

305,021 Multiple switchboard for telephone exchanges; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Manufacturing Company, same place.

305,022 Self-sustaining electric battery; William Anthony Shaw, Brooklyn, assignor of one-half to Lebbeus H. Rogers, New York, N. Y.

305,023 Production of pipe-line and other batteries; William Anthony Shaw, Brooklyn, assignor to the Electrical Accumulator Company, New York, N. Y.

305,025 Telephone and telegraph switchboard; Elliphalet W. Smith, Newark, N. J., assignor to the Overland Telephone Company, of New Jersey, same place.

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PATENTS! Thomas P. Simpson, Washington, D. C. No pay asked for patent until obtained. Write for inventor's guide.

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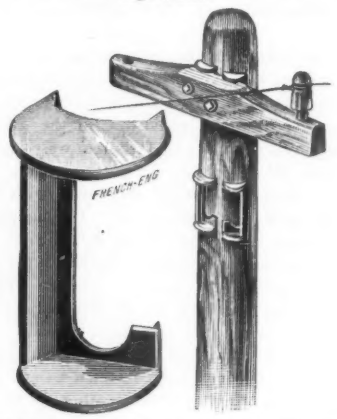

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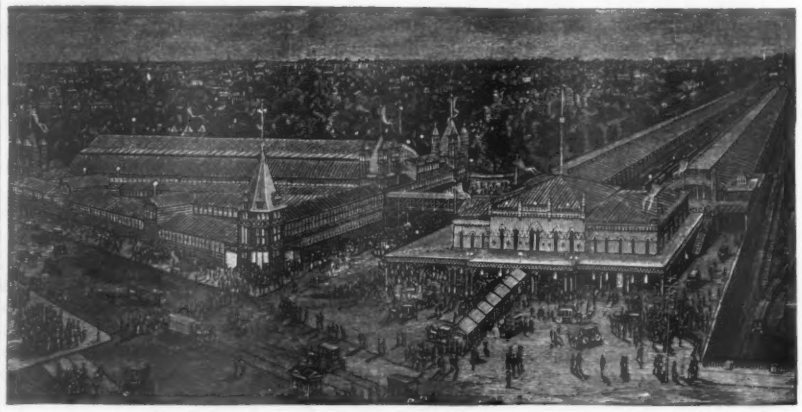

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